BULLETIN OF THE

TAYLOR SOCIETY

AN INTERNATIONAL SOCIETY TO PROMOTE THE SCIENCE
AND THE ART OF ADMINISTRATION AND OF MANAGEMENT

IN THIS NUMBER

Specimen Chapters from:

"Scientific Management in American Industry"

December Meeting Papers:

A Technique in Employment for Subexecutive Positions

Cost Finding for an Electric Utility

Engineering Societies Building
29 W. Thirty-Ninth St.
New York

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APR 1 1929
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APRIL, 1929 VOL. XIV, NO. 2

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The objects of this Society are, through research, discussion, publication and other appropriate means:

1. To secure—for the common benefit of the community, the worker, the manager and the employer—understanding and intelligent direction of the principles of administration and management which govern organized effort for accomplishing industrial and other social purposes.

2. To secure the gradual elimination of unnecessary effort and of unduly burdensome toil in the accomplishment of the work of the world.

3. To promote the scientific study and teaching of the principles governing organized effort, and of the mechanisms of their adaptations and application under varying and changing conditions.

4. To promote general recognition of the fact that the evaluation and application of these principles and mechanisms are the mutual concern of the community, the worker, the manager and the employer.

5. To inspire in labor, manager and employer a constant adherence to the highest ethical conception of their individual and collective responsibility.

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APR 30 1929

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BULLETIN OF THE
TAYLOR SOCIETY
AN INTERNATIONAL SOCIETY TO PROMOTE THE SCIENCE AND THE ART OF ADMINISTRATION AND OF MANAGEMENT

Published by the Taylor Society Incorporated at
Engineering Societies Building
29 West Thirty-Ninth St., New York
Cable address: Taysoc

The BULLETIN OF THE TAYLOR SOCIETY is included in the indexing of the Industrial Arts Index which is obtainable at Public Libraries.

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Published every other month. Per year to Members $2.50; to others $3.00. This issue $1.00.

Entered as second-class matter, Dec. 17, 1921, at the Post Office at New York, N. Y. under the Act of March 3, 1879.

VOL. XIV APRIL, 1929 No. 2

Contents

Comment 53

Specimen Chapters from "Scientific Management in American Industry"

Chapter IV. Research for General Administration 55
By Robert W. Burgess

Chapter XXVIII. The Response of Workers to Scientific Management 61
By Ernest G. Brown and N. I. Stone

A Technique in Employment for Sub-executive Positions 71
By E. Hayden Hull
Discussion by Frederick G. Atkinson, W. V. Bingham, Samuel S. Board, C. R. Dooley and R. H. Fogler

Cost Finding for an Electric Utility 86
By Hudson W. Reed
Discussion by John Bauer, Philander Betts, Judson C. Dickerson, Samuel Ferguson, Malcolm F. Orton and Otto M. Rau

News of the Sections 107

Fourth International Management Congress 108

The New Germany—A Review . . 108
By Sylvia Kopald Selekman

Reviews 109

Comment

IN THIS issue two additional major papers of the December Meeting are given permanent record. Mr. Hull's paper presents a new technique of selection of candidates for sub-executive positions. It is not offered as a substitute for aptitude tests, performance tests and performance records, but as a supplement to these. One of the most fundamental factors bearing upon the success of an individual is personality. It is also the most difficult to discover and appraise. Mr. Hull presents what is essentially a technique of analysis of long-run conduct for the purpose of uncovering basic personality. The reader will be interested in this paper in the proportion that he recognizes the importance of personality as one of the fundamental factors of success.

THE other paper, by Mr. Reed, is a description of scientific management cost accounting in one of the most difficult of cost accounting industries—that of public utilities. Cost accounting in scientific management aims to furnish data in terms of management operation units continuously and promptly — promptly enough to permit control of the operations in the light of the facts disclosed by the cost records, whereas conventional cost accounting yields only historical records of past costs too late for use in management control. We are pleased to put this particular case on record principally because readers who recognize how difficult it is to apply precise accounting to the industry concerned will take heart in their struggles to develop similar accounting methods in other industries in which it is much less difficult.

WE ARE, on the outside book cover of this issue, making the first public announcement of the Taylor Society book, "Scientific Management in American Industry" and a very generous prepublication offer by the publishers of the book, available to members and subscribers to the BULLETIN. In this issue are printed also two specimen chapters of the book.

The preparation of this volume was stimulated by frequent demands for our recommendation of a comprehensive treatise on scientific management. There is no such comprehensive treatise. The Taylor, Gantt and Gilbreth classics were not comprehensive treatises. Neither was the excellent collection of articles by Bertrand Thompson some fifteen years ago, although at the time of its publication it gave the best picture of the subject. All of these were published before the recent enlightening experience with scientific management in other fields of management than production. The Society believes, therefore, that the time is ripe for a new exposition.

The extent of the development of scientific management is such that it is realized that no one book can cover the subject completely in minute detail. Furthermore, while universal in its principles, its objective manifestations must vary from plant to plant even in the same industry. Its most basic principle of research into "the law of the particular situation" requires that objective manifestations must fit the particular situation. Therefore the purposes of this book are: first, to give a correct perspective of the fundamental principles of scientific management; second, a similar perspective of it with respect to the functions and departments of enterprise; third, the more important principles pertaining to each function or department; and fourth, illustrative cases of its application. Although a book of multiple authorship, careful planning and editing give it, we believe, a satisfactory unity of style and treatment.

Workers' Response to Scientific Management

THE parallelism between the responses of workers to scientific management in a non-union and a union shop, brought out on other pages of this issue, is remarkable and interesting. The similarity of occurrences in two widely separated places, at different times and in dissimilar industries, may be taken as an indication of what will usually happen in developments of scientific management.

In both cases the concerns were established and profitable, of moderate size, and not by reason of current financial returns under the necessity of undertaking the development of new management methods. The businesses, however, were without satisfactory cost accounting systems, or indeed, any systems at all, making it obviously impossible to understand working performances in the detail necessary for their improvement.

In the beginning the foreman groups were strongly skeptical, unsympathetic or even antagonistic, a quite natural product of the fact that it had been their custom to "do it all," and it was the obvious intent of scientific management to remove those functions properly to be regarded as belonging in other places, and to free the foreman for his real duty of departmental supervision. The necessity of a slow and cautious beginning, acceptance of the probability of encountering in the early growth a difficult period attended by the addition of extra real expenses of considerable amount, and a reduction of this expense as the procedures are perfected, seem adequately demonstrated.

The importance of having in the early stages of development the co-operation of the leaders in the worker group and of having it shown in the very beginning that the intent of scientific management is to yield advantage to the worker, is very well emphasized. In the course of the developments there was a shortening in the hours of work per week and concessions in wages not properly related to performances. There was operator resistance to training for new jobs and to interruption between jobs as finished work is exchanged for new work.

The main points of dissimilarity in the two instances seem to be that the managements themselves were enthusiastic in one case and skeptical in the other, and that the development at New Haven was under the direction of an engineer as consultant, while at Rochester it was carried on entirely by the plant's own staff.

From the standpoint of managers generally it is important to make the observation that the acceptance of the principles of scientific management is complete at both plants, and the serviceability of scientific management procedures is well demonstrated over a period of many years.

Southern Meeting Postponed

Because of extremely disturbed conditions in one of the most important of Southern industries—the textile industry—it is realized that the time is not opportune to ask Southern owners, managers and workers to leave their plants for purposes of attending any kind of a convention. The Taylor Society has therefore reluctantly decided to postpone the meeting planned for May 1 and 2 in Charlotte, N. C.—the more reluctantly because at this late date it will be impossible to arrange a convention at another place this spring.

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[1] Cf. pp. 61-70.

Specimen Chapters

From "Scientific Management in American Industry"[1]

CHAPTER IV

Research for General Administration[2]

IF MANAGEMENT is to be in any sense scientific, it is essential that administrative decisions be based on investigation and analysis of facts rather than on the arbitrary and hasty edict of officials. The type of investigation which deserves first attention from the logical point of view is concerned with those problems of general administration which are the province of the president and the board of directors. It must be admitted that these problems, while logically first, have been almost the last to receive systematic attention, and even now have received less careful treatment than the more limited but concrete problems of the shop. In fact, many even among business men do not distinguish clearly what general administration is, or realize the importance of careful analysis of its problems.

The Nature of General Administration

By general administration is meant the determination of the general policies of the business, the adaptation of general plans to changing conditions, the co-ordinating control of the various major functions of the business, and the appraisal of results secured by departments. The existence of such a thing as general administration may not be recognized by the chief executive of a small concern, whose mind is occupied by particular problems of buying, selling, designing, making, employment, or pay adjustment. But in any business which grows past the point where one man can personally make all decisions, it is necessary, first, to cease deciding every issue as a separate special case and to establish normal policies and procedures; and second, to separate the problems of general concern from those pertaining to only one function of the business.

Let us consider briefly what are the distinguishing features of general administration as contrasted with the administration of various functions.

The merchandising and sales functions, as distinguished in subsequent chapters, are concerned with most of the specific problems of distribution, such as market analysis, analysis of the value and uses of goods, the computation of sales-production schedules, the computation of detailed prices, the determination of quotas, the training and direction of the sales force, detailed records of orders, sales and stocks, and advertising. But the function of final decision with respect to such things as the desirable volume of sales, quantity of advertising and pricing policy—matters requiring a balanced point of view because involving general policy and a balancing of departments—is a general administrative function.

Likewise purchasing is a special function concerned with such activities as selection of sources of supply, analysis of price tendencies and the placing of orders. But such problems as determining whether purchases shall be on a "hand-to mouth" basis, or whether forward buying may be advisable, are general administrative problems.

The administration of receipts and expenditures, the keeping of general accounts, and the analysis of the results of expenditures, are particular responsibilities of the treasurer and the comptroller, but such problems as whether a new bond or stock issue shall be made to finance an expansion, what method of depreciation shall be utilized in accounting, and how additional capital shall be invested, are problems of general administration.

The engineering department is concerned with invention and design, but the adoption of an invention or design is an administrative problem. The personnel department is responsible for such things as employment and training of workers, safety and health, and the administration of benefit, stock purchase and similar plans; but determination of wage policy or the institution of a stock purchase plan, are responsibilities of general administration. With respect to the production processes there is least likelihood of confusing responsibilities. The departmental staff is concerned with the immediate processing, and with what, how much, when and how in detail; but general administration is concerned with such things as what, how much, when and how in the large, as concerned with general policies, and with investments in new facilities.

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[1] To be published by Harper & Brothers for the Taylor Society. See table of contents on the outside back cover of this issue.

[2] By Robert W. Burgess, Senior Statistician, Western Electric Company, New York.

The key topics around which general administration revolves are earnings and dividends, wage policy, determination of general line of product or service to be supplied, approval of technical research programs, the budget, turnover of investment, comparison of operating results with those of preceding years, and with the budget, prices, depreciation, taxation, and plant location.

Division of Managerial Labor

It must be admitted that some, even among successful executives, do not distinguish general administration from other functions as we have done. Another point of view is that the duty of the president of a company is to devote himself to those duties which seem to him at the moment to demand special attention, either because of their importance or because of the unsatisfactory nature of the work being done by the officer immediately in charge. According to this point of view, the president ought to be more capable than the other principal officers in every one of their duties. Experience shows, however, that this demands an almost impossible collection of abilities in one man in the case of large concerns. It seems more in accordance with the general principle of division of labor on which modern industrial organization is based to regard general management as a separate craft, with sales management, management of design engineering, factory operation, and so on, as other crafts. All of these managerial crafts are to be distinguished in turn from the skilled trades and the business professions, such as engineering and accounting. It is, of course, true that a natural way to become a qualified practitioner of the crafts of general management is to begin in a skilled trade or work of a professional type, to progress to the type of management associated with that trade or profession, and finally to enter upon general management. While such a method of approach to a general managerial position is natural, it is important to recognize that the steps are marked by definite changes in type of work.

If this point of view is accepted, the following corollaries appear to follow:

1. The fact that a man is highly skilled in a certain trade or business profession does not necessarily imply that he will be a good man to administer a department whose workers are mainly of that type. In any case, he should realize that it is a different job which requires a different attitude of mind and probably additional training.
2. The fact that a man is a good department manager does not necessarily imply that he will be a good general manager, unless he adopts a broader point of view.
3. A high-grade specialist, in the engineering laboratory for instance, may deserve a larger salary than the supervisor to whom he nominally reports, if the specialist is a more valuable expert in his craft than the supervisor is in the work of management.
4. A functional manager, such as a sales manager, who is unusually successful, may be entitled to greater compensation than the president of his company. Admittedly this is true only in unusual circumstances, as men who are really capable in the field of general management have a high scarcity value.
5. If a president believes that the work of a particular department is not being done satisfactorily, the best remedy is not to do the most important part of that work himself, but (1) to try to correct the department manager's faults, (2) to rearrange the assignment of duties among different departments so as to meet the difficulty, or (3) to replace the department head by somebody presumably more competent.

Research for General Administration

Even if we regard general administration as a separate craft, in which a man may become qualified without being omniscient, the task of the general administrator is nevertheless most exacting and calls for the use of the best aids that experience has developed. One of the most important aids is research, carried on by himself or others, devoted specifically to these problems. By "research for general administration" we mean:

1. Any attempt to discover, by analysis of operating returns, comparison with related information, or by additional investigations, what are the results of any existing general policy or what the effects of any proposed change in policy or plan of operation would be.

2. Development of methods for appraisal of results secured by different departments or for general control.

The underlying motive back of such research is to secure a broader perspective than is present without it, by comparing the present with the past or the estimated future, by comparing the particular company with other concerns, or the particular industry with other industries.

The sphere of research does not include those modifications of plans which are often made by industrial concerns for personal reasons. It seems clear that in certain cases it is desirable to take account of the capacity of the individuals concerned or even of their likes and dislikes in deciding what is the best thing to do. From the point of view of the executive interested in general administration, however, any recognition of the personal factor is fraught with the danger that it may be somewhat of a departure from strictly scientific management. Certainly no president of a company can justify a plan which is based on his own dislike of some other man. On the other hand, a plan must have the support of individuals if it is to succeed, no matter how scientifically it may have been made. It is the province of the practical administrator, as distinct from the research worker in general administration, to temper the details of a scientifically drawn plan so that it will be understood and used whole-heartedly by the entire company.

Kinds of Research and Typical Problems of Each Kind

1. *Business Conditions and Tendencies.* The meaning of research for general administration will be brought out by discussion of some of the lines of research which have been undertaken by progressive concerns and of various typical problems of each kind. One of the first and still one of the most prominent kinds of research is analysis of the current rate of business and industrial activity. The purpose of such research is to guide executives as to the correct timing, with respect to industrial conditions, of projects such as purchases, plant expansions, advertising campaigns, and variation in the size of the working force. The general method is to survey at regular intervals the various barometers of such items as production, prices, employment, earnings of industrial concerns, and outstanding business or political events. The aim is, in brief, to determine what is the present position in the business cycle and to estimate, if possible, the course of events in the near future. The development of this idea requires the use of certain statistical techniques, especially determining index numbers, trends, and seasonal factors, as any forecasting is significant only if based on a careful analysis of past relationships. As it is impossible to go into details as to this type of analysis in the space available, the reader is referred to references two and five at the end of this chapter, illustrating these methods.[8]

It may be noted that the United States is especially fortunate in possessing a large volume of current business statistics, prepared by governmental and other sources, and made available promptly month by month.

2. *Analysis of Industrial Developments.* Another kind of research which is related to the preceding, but may well be distinguished therefrom, is an analysis of industrial developments with a view to determining the significance for the researcher's own company of changes in the economic environment. This type of research is carried on by (1) extensive study of current business and economic literature; (2) personal contacts with government officials, business executives, analysts, etc.; (3) continuing study of trends of important series; (4) intensive study of problems that seem to have significance for the particular concern.

As problems typical of this kind of research, the following are offered:

a. Under what conditions has vertical combination of industry been successful? Has it been more likely to succeed when two different companies have been united, one of these companies being the consumer of the other's products, or when a large company has added a new department to take care of a stage in production either before or after that previously handled?

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[8] The references mentioned are: Burgess, R. W., *"Introduction to the Mathematics of Statistics,"* New York, Houghton Mifflin Company, 1927; Harvard Committee on Economic Research, *"Review of Economic Statistics,"* Preliminary Volume I, Cambridge, 1919.

b. What is the significance of the decrease in factory employment accompanied by an increase in output? To what extent is this increase explained by increased efficiency of the individual worker, by more careful selection of workers, or by greater use of machinery? What are the results on supply of factory labor, consumer demand due to reduction of number of workers receiving pay envelopes, and increased need for measures to relieve the unemployed?

3. *Analysis of Internal Conditions.* The two preceding kinds of research have to do primarily with the world outside the particular company. Another appropriate field for the activity of a unit or department devoted to research for general administration is the analysis of internal conditions affecting more than one department or function. The purpose of such analysis is to investigate and report on the internal operations of the company so as to facilitate wise decisions as to major questions of policy. A helpful element in these investigations is comparison with figures for outside concerns.

Among the typical problems of this kind the following may be mentioned:

a. Will it be more desirable for the company to continue to purchase items of a certain class or to manufacture them? It is obvious that light may be thrown on this question by the investigation of vertical integration of industry.

b. What have been the price trends of what we buy and what we sell, in such form as to permit fair comparison with general price trends?

c. Are the changes in price of our product accounted for by changes in costs of our raw materials and labor, and by increased efficiency?

d. What obligations has the company already incurred under its pension plan, and what will be the annual increase in such obligations? What method of providing for these obligations is desirable? This problem is related both to the accounting function and the personnel function.

c. What is the typical rate of increase of employe earnings with increasing service? Is this condition satisfactory, in view both of what other companies do for their employes and the necessity for maintaining production costs at as low a level as possible?

4. *Standard Control Ratios.* The types of research mentioned above are concerned with the formation of general plans and affect the board of directors especially. Another type of research fits in more closely with the job of the president. In order to control the progress of the company, to see that policies are being carried out and to call attention to places in the organization which require special executive action, it is desirable to follow currently certain key ratios. Before such ratios can be used to advantage, research is necessary to develop the true significance of particular values of these ratios. For instance, one of the important ratios used in railroad administration is average number of miles per day for each freight car. By comparing the current result with an average for earlier periods or for similar roads under similar conditions, the executive is able to detect unusual conditions. It is not safe, however, for this comparison with previous experience to be made on a superficial basis, or to accept without investigation the opinions of "old timers," which are probably not sufficiently modified to reflect changed conditions. It is sometimes advisable to check a suggested scheme by using it informally for a while before making it a basis for executive action.

Railroad administration is full of ratios which are used for control purposes, such as revenue per ton mile, cost per ton mile, ton miles per engine mile and percentage of bad order equipment. Other questions which call for determination of ratios are as follows:

a. What return on investment is reasonable and fair for a manufacturing subsidiary of a public utility?

b. What ratio of current assets to current liabilities is advisable for a concern such as John Doe and Company?

5. *Appraising the Work of Departments.* Another kind of research of a more difficult and controversial nature is the development of methods for appraising the work of major departments. In most organizations at present the judgment of the chief executive as to the effectiveness of a department depends largely on personal impressions and a rather vague evaluation of its performance. The records tell, especially if control ratios have been developed, more or less about what the department

has actually done, but give a less definite analysis of the obstacles which were overcome and the resources available to overcome them.

In spite of the indefiniteness of the information available, the chief executive is continually required to decide how satisfactorily each department is doing its work and which department heads should be transferred to other spheres of usefulness. It is therefore desirable to work out methods by which he can form a more scientific judgment and such methods are in the process of development in a few special industries. They are not yet developed, however, as a general procedure. One of the major difficulties is a natural result of the fundamental nature of the problem. A good method for evaluating the success of a particular department may show that it is much overmanned, or that the head of the department is grossly incompetent. Human nature being what it is, it can hardly be expected that department heads will be enthusiastic about helping to devise searching tests of their own efficiency.

One obstacle which has hindered an adequate development of methods for testing departmental efficiency is the notion that a supervisor of any grade should know as far as possible all the details of the work done by his subordinates and can measure their performance only by being able to do a better job himself. As long as this omniscience is the ideal, it is difficult to develop practicable methods. The truer view seems to be that while detailed knowledge is helpful, higher executives can seldom know their subordinates' jobs as well as the latter do, and success in executive work depends on acquiring skill in watching results and "spot checking" details rather than in attempting to follow every step.

It seems clear that the most successful line of attack on the problem of developing general methods of appraising the work of departments lies in developing a large number of measures, each subject to limitations and requiring skillful interpretation. A most essential thing in working out such measures is an objective attitude and a clear realization of the exact function of each department in the organization.

Typical problems are as follows:

a. Has the advertising department spent more or less than was justified? (The answer to this question is especially difficult if the advertising is of the so-called "institutional" type, of which the object is to develop good will rather than to sell specific items.)

b. Is the purchasing department doing a good job, allowing for the way that instructions have come to it from the sales and manufacturing departments, and for market fluctuations in price?

6. *Combination of Several Types.* It is clearly desirable to try to solve management problems in the form in which they come to the general manager. Even though the problem might be broken down into parts, each of which could be classified under one of the types discussed, the real desideratum is not the solution of these partial problems, but the co-ordinated answer to the original question in the form it actually occurs, so as to furnish the best available guidance to those responsible for executive decisions.

As the problems of this type are made up of a combination of problems of the types previously discussed, the methods to be used are a combination of all that have been mentioned—historical, mathematical, statistical and economic.

The following typify the problems which we would classify under this head:

a. What estimated rate of activity in this industry (especially for this company) should be used as the basis for budget and other forecasts? (Combination of Types 1, 2 and 3). A valuable guide in dealing with this problem is the discovery, by the use of the statistical method of "correlation," of series whose fluctuations precede those of some series measuring the activity of this company or industry.

b. What policy should be adopted in regard to setting up depreciation reserves for plant and machinery? This problem really involves both the second and the third kinds of research noted above, as the appreciation of the need for a systematic depreciation policy involves both an understanding of the way industries have faded away, either as a whole or in particular localities, and an analysis of the replacements which have been or are likely to be necessary in the particular plant because of wearing out, obsolescence, or inadequacy. An understanding of economics will also answer the objection that depreciation is a question of accounting rather than general administration, by bringing out that the chances of ultimate success or failure, and the propriety of a particular rate of dividend, depend to a considerable extent on the depreciation policy adopted.

c. Will it be more profitable to do a small business at high prices, or a large business at low prices? (Combination of 2 and 3 and general economics).

d. What shall be company policy as to replacing obsolescent machinery? (Combination of 2 and 3.)

e. Shall supplies ever be purchased ahead of actual needs in an attempt to take advantage of price fluctuations? (Combination of 1, 2 and 5.) (Decision rests on whether correct anticipation can be made of prices and company needs.)

f. Should salaries be advanced relative to wages to return to the 1914 relationship?

Selection and Organization of Research Workers in General Management

Three procedures are open to a company which believes that it would be profitable to do some research work in general administrative problems:

1. Members of the present force already occupied with line or staff functions may be asked to undertake this type of work in part of their time, being relieved of part of their present responsibilities to make this possible. This plan seldom results in much thorough-going research, even when the employes concerned have somehow acquired the research attitude. The difficulty is that the duties resulting from the more urgent established functions tend to absorb all of the time and energies of such part-time researchers.

2. Consulting specialists in economics, statistics, or business management may be called in to report on particular problems. The best instance of this procedure is the investigation conducted by Professor Seligman of Columbia University on "Instalment Buying," which was made at the request of the General Motors Corporation. The procedure is most likely to work successfully on problems which are of a general nature, and therefore familiar to an outsider, and least likely to be successful on problems which involve complicated interrelationships between various phases of the business of a particular concern. For the ordinary concern which is not in trouble, the outside consultant is not favored except for new and unusual problems. A specialist who has been a part of the company long enough to understand thoroughly its established policies and peculiar problems, can usually suggest a method for handling a problem which fits in better with the established order. Of course, when the inside specialist has failed to solve the problem, and the difficulty continues and becomes serious, the outside specialist may be of great help.

3. A new unit may be established within the organization to carry on research in the various types of problems of general administration outlined in the previous section. This unit would probably also, especially in smaller concerns, do research work in problems of purchasing, selling, industrial relations or other functions as well as for general administration. If this is planned, care should be taken that all the energy of the new unit is not diverted from the general problems to the concrete and often attractive problems of these special fields.

The first essentials for workers selected for such a research unit is that they shall have minds of the analytic type and that they shall have the scientific attitude that problems should be solved by an impersonal determination of the facts and analysis of such facts by the best available methods. Usually this requirement implies special training in statistics, economics, or business administration, or perhaps in physics, chemistry, mathematics, biology, engineering or other sciences. If the unit contains more than one worker (other than clerical), it is desirable that they have different types of training and experience. One man, for instance, may be an economist with special university training; another an engineer with experience in the company; a third an actuarial statistician, and a fourth a practical accountant familiar with the records kept by the different departments.

In dividing the work among several men, problems of the first and second type mentioned above —analysis of current rate of activity and analysis of industrial developments—might be made the special field of one man; problems of the fourth type might be assigned to a second man, and so forth. It is also usually advantageous to assign clerical helpers more or less permanently to the same jobs, so that as soon as the method of handling a recurring problem has been worked out, the maintenance of the records and routine analyses can be left largely in the hands of the clerks, thus releasing the trained specialists for assaults on new difficulties. Permanent assignment also makes it possible to train the clerical workers in specialized statistical techniques. Calculation of correlation coefficients, for instance, and of seasonal factors, can be carried through almost entirely by clerks who are specially trained.

The attachment and name of the research unit for general administrative problems is a matter on which practice is not uniform. It may be called the Statistical Department or the Planning Department, and its head may report directly to the president, or perhaps more often to the comptroller, if that officer is responsible for co-ordinating the facts used as a basis for decisions by the board of directors. The essential points in this connection are that the field of activity of the unit shall be clearly understood, that it shall have authority to get the necessary internal facts that it needs, and that its findings shall reach with reasonable directness the officers who are really responsible for deciding policy.

Miscellaneous Principles and Suggestions

As in part a restatement of some of the points of this chapter, and in part a statement of related ideas which have not been mentioned, the following comments are made. It is still too early in the development of research for general management to lay down any set of formal general principles.

1. Every problem in management should be analyzed without passion, prejudice, or desire for personal advantage.

2. As decisions on questions of general management require a difficult combination of detailed knowledge of a particular problem and a broad view of all aspects of the enterprise in relation to the industrial world, co-operation of specialists and general managers is essential.

3. Staff specialists assigned to assist the general management should combine as far as possible experience in the particular enterprise with a broad range of interests and the attitude of scientific research. Academic training in the physical sciences, mathematics, or economics has often proved advantageous.

4. Information from all departments should be furnished regularly to some central department in so far as it is really desirable for deciding questions of policy, for appraisal of results secured by departments as a whole, or for central control. Reports comparing the units within a department or helping to control the relative rate of activity of such units, should not be centralized.

5. The task of deciding on policies and seeing that they are carried out should be recognized as distinct from the task of investigating problems. Whether or not the same officers or employes do perform both functions is a matter on which the practice is not uniform. In general, little thoroughgoing research is likely to be done unless some workers are assigned to that function without executive responsibility, except for work closely related to their research.

6. As data are seldom available by which most questions of general administration can be treated with scientific rigor, it is usually necessary to include an element of judgment in the final decision. The function of the analysis is often to rule out some possible decisions and to modify in detail the decision finally adopted rather than to secure a logically inevitable "right answer."

CHAPTER XXVIII

The Response of Workers to Scientific Management

I. Experience in a Non-Union Shop[4]

IN 1917, early in his business career, the writer became a student in a course of scientific management at the Acme Wire Company, New Haven, Conn., manufacturers of insulated wire and electrical coil windings, then employing about 1,000 workers. As student the writer received his training through actual participation in the processes of development, and eventually he became responsible for the technical problems of standards, process engineering and control, involving refinement and further development of manufacturing and control methods.

This company was organized in 1904 and in 1917 had completed a period of extraordinary success, due partly to an exclusive patent privilege in one line of its business, partly to a practical monopoly in another line, and partly to a vigorous one-person general management. Over this period, however, because of growth and other reasons these favorable factors tended to be neutralized, the company decided to secure the advantages of scientific management, and the development was begun in 1911 under the guidance of an engineer retained for that purpose.

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[4] By Ernest G. Brown, Associate Secretary of the Taylor Society; recently Chief Engineer of the Acme Wire Company, New Haven, Conn.

From the beginning there was an enthusiasm for scientific management on the part of owners and managers. Both the President and the Vice President and General Manager had attended the First Conference on Scientific Management at the Amos Tuck School, Dartmouth College, in 1911. The situation was unbalanced, however, in the respect that this enthusiasm of the managers was not matched by an enthusiasm of equal degree in the foreman group. For a long time the obscurity of certain results obtained, and the difficulty of showing other more obvious results prevented this balance from being secured. During that period the effects appeared to be detrimental.

The original shop organization was the old-fashioned "foreman do it all" type. The orders obtained by the sales department were first approved by the general manager and then a sufficient number of copies were made so that the stock room and each department affected received a copy. When these copies were distributed, the main office washed its hands of the transaction until a customer complained that he was not getting the goods. In the handling of the orders themselves the foreman had entire charge of the work in the shop. They ordered out all of their own materials as they thought they needed them. The operators kept track of their own times, usually waiting until morning to put down a record of the work done the day before. There was total absence of planning, scheduling, control, and accounting in the modern sense.

At this point a little understanding of the nature of the manufacturing processes is necessary for an appreciation of the decisions made at the beginning of scientific management, the effect, the consequent difficulties and the ultimate solution. The final result, too, is perhaps more interesting because the difficulties of development had a constant reaction in the attitude of the workers.

The business was divided into two general parts, nearly equal; (1) insulated wire, consisting of copper conductor covered with enamel or cotton or silk; (2) electrical coils for meters, automobile starting and ignition systems, controllers, and so forth. The finished wire product (1) was the principal raw material for the coil manufacture, although considerable quantities of wire as such were also sold to other manufacturers.

The decision was made to begin the development in the coil division, not because it was the more logical place to start, but because it was at once more vital and apparently simpler. At the inception of standardization preparatory for rate setting, the purpose of scientific management was thoroughly outlined to the most reliable girl operator at coil winding, the first coil operation. This operator was immediately co-operative, and ready to help. (It is interesting here to note that she later became instructor, then time study observer, and is now in charge of all product cost estimating, using standards cost accounting, in which position it is one of her functions to set standards of operating performance used generally throughout the plant.) The conditions under which work was done at her work place were standardized, stop-watch observations taken, a task fixed, and a bonus offered which the operator herself suggested as being satisfactory in amount for the effort expected. On the first day of operation under task and bonus the progress was followed constantly, and at the end of the day when the performance was completed with satisfaction to all concerned, a ceremony was made of the presentation of the bonus in specie right on the spot. For a while thereafter the distinction between base pay and bonus pay was maintained by putting bonus pay in a separate, special red envelope. The demand by the other operators for this consideration was immediate and insistent, and development thereafter proceeded without any difficulty with the workers on these accounts. The outline of the steps taken at this time is contained in an officer's report before the class of students of management:

> Of course we took the skeleton of scientific management, consisting of the organized stock room; balance of stores; planning department with its functions of design, routing, time study and instruction cards and the bulletin board control of operations. This skeleton we took bodily and put it into practice and at the same time we had a complete audit of our books, and installed something very like our present cost system. A purchasing agent was appointed and started on his duties; the whole factory was redivided

into departments; the auxiliary functions more sharply defined and separated from the production. All this work was accomplished with a growth which has averaged almost a doubling of the shop every two years. A great deal of it, of course, would have been necessary whether we had had scientific management or not, but I do feel, however, that scientific management enabled us to expand without the growing pains which we otherwise would have had.

Our engineering department, balance of work and production control are the most recent of these functions which can be traced to scientific management.

We have some concrete examples of actual reductions on specific jobs which the installations of task and bonus have enabled us to effect. The actual gains made, when the standardizing of conditions had been completed, and task and bonus actually put into operation on the winding operation, on the type of coil of which we had the largest output at that time, was 120 per cent. When the superintendent who was in charge of the winding department saw what the task on that coil was, he said not only that the operator to whom it was assigned would not make it, but that no human being could ever make it. It was rather interesting to know that the girl made the first batch without any trouble at all, and continued to do so until she was made instructor in the department.

That very fact led to the improvement in the output on other types of coils before any task and bonus had been applied to them. It was not very great, but it showed what could be done.

In the assembling work the gain was even more noticeable.

The company had not had a satisfactory cost system previously, so that it was not possible by comparison of new costs with old to measure accomplishment as these various things were done. It was unfortunate that this very absence of adequate records covering the early period of growth led to a desire for them so great as to result in a control system too fully detailed and a system of records much too complicated. The maintenance of these interfered with the efficient accomplishment of the workers' real tasks, and the dispatch, collection, recording and handling of them resulted in the growth of an overhead organization of unjustifiable proportions. The support of that overhead increased the load upon the direct production forces, and led to feelings of antagonism, chargeable to the overload of details rather than the principles of scientific management. These details to a certain extent concealed the good effects obtained in other directions. There followed recognition of this attitude by the management through rate changes, alteration of method of wage payment, and shortening in the hours of work per week that properly would be classified as concessions.

Much of this effect was due directly to an over enthusiasm to have the development of scientific management completed expeditiously, because practically the entire plant, involving an extremely variable type of manufacturing, was included in the development before any one division was really completed. To some degree this was a consequence of having an unusually satisfactory result with certain individual tasks worked upon in the beginning, but it was more directly the result of having started the development with the secondary rather than the primary operations, which is referred to above and again later.

In the course of time all of these situations came to be recognized for what they were, both by the management and the workers. Eliminations and corrections were progressively applied, and rarely were any of these at odds with the principles set up in the very beginning; as a matter of fact all of the functions described in the preceding officer's report, except bulletin board control, are still in effective operation. With these changes came final general acceptance of these principles by the worker group. A lack of standardization or a failure quickly to provide time study on new operations are now so insistently presented by the workers and their immediate supervisors that they represent a positive demand; notwithstanding the fact that the control operations are in the hands of a staff, not the operating, unit of the organization.

An interesting example of the real worth of this final attitude on the part of the workers is found in the recent experience of this company with group bonus installation. As a result of the foregoing experiences a more deliberate start was made in one small, detached, department, and, after the advantage to the worker as well as to the company was understood, the work proceeded within the next few months through twelve large departments with marked success. This development required the workers to understand a whole new set of factors, for in many cases a single group involved more than a hundred individuals.

It is worth while to generalize to some extent upon the principles involved in this development, because it was not always smooth going, not always economical, although economies were constantly dominant, and the final result was possible largely because at every stage the workers were ready to co-operate in the measures decided upon.

It was shown that before the actual demonstration of the advantages of the systems to be undertaken, no argument will carry more weight with the workers and their supervisors than the contention that *no plan that does not deliver to them some share of the advantage accruing from its operation will ever be permanently successful.*

This principle does not have to be taken entirely on faith, because the field of business is full of examples of failure on account of lack of recognition of it, and of other examples where regard for it has brought outstanding success. Reference to these is effective, because no person or group is uninterested in its own success if it can be assured in advance. And one may always be absolutely confident that any plan which gives all the benefits to either one side or the other is charged with all the elements of inevitable failure.

To have acquired the workers' consent, or at least a willingness to be shown, is a very good beginning; but to have it will serve to emphasize certain other necessities that have definite bearing upon the result.

The fixing of standards of equipment and process may in most instances then be done entirely without the worker's further co-operation; but that work will be better done with it than without it, and the fact of co-operation will tend to strengthen the position already reached. In almost no case is it reasonable to suppose that the worker group is incompetent to contribute details of value to a plan new as a whole. The ready acceptance and recognition of such of these details as have merit will substantially improve the plan, their inclusion will lift its value in the eyes of those who are to operate it, and the whole outlook will become progressively better.

At this stage accuracy is a prime essential. The nature of the new procedures of management will not permit their complete development by experimental application in the seclusion of a laboratory before they are thrust out into the shop to stand on their own. Their original trial must be in the shop and in the presence of their critics, and the greatest pretrial guarantee of success is the intrinsic accuracy of the design of the plan and its execution. No factor is more powerful than measurable success from the start, and no result is more devastating than a failure that can be attributed to a neglect of facts and the necessary regard for accuracy. No group is more acute than the workers in detecting the failure of a procedure to conform to facts of operating situations.

The presence of accuracy is a fortification against attack from the skeptical worker. A machine, a tool, a work place redesigned so as to compel recognition as more practicable and productive, a task well set, and a plan of control obviously fulfilling the requirements of production and at the same time no burden upon those who work with and under it—all of these springing out of a desire for results and a regard for accuracy—compel appreciation on the part of those in the ranks who are skeptical but not unwilling to be shown.

The factor of accuracy has other advantages. Not only is there no repetition of effort, actual waste of time, or loss of effect, but there is also a guarantee of deliberateness that may be very necessary. Many plans have been attempted and failed when a more deliberate consideration of their construction would have exposed their weaknesses.

In the case under illustration there was certain violation of the two factors of accuracy and deliberateness. It will be recalled that the development was undertaken on the coil manufacture, or finishing operation, rather than upon the preliminary wire manufacturing operation, because it appeared simpler to do it that way, and that the systems adopted were too detailed in technique. Experience proved that the development of the wire manufacturing operations and their methods of control had such great bearing upon the use of wire as coil material at the later operation, that the coil operating standards were necessarily under constant revision. This left the whole plant under development at once, a situation which ordinarily would not be attempted in large-scale, variable manufacturing to customer specifications. It was not until the preliminary wire operations were finally brought under control, involving the expenditure of several hundred thousand dollars for equipment of new design, that the full effect of the development was realized.

The development of new methods is of course a direct encroachment on the field of the immediate supervision of labor. If a foreman has had connection with a certain activity over a considerable period of time—and it is usually such an experience that partly entitles him to his position—a natural product of that association is the feeling that nowhere in the organization does there exist such a wealth of detailed knowledge concerning that activity as his own. If it is an old-time shop such a feeling will have been fostered and strengthened by the plant managers, who assume that it is the function of a foreman to know all about his department and to run it the one best way. Standardization of equipment and processes and subsequently time study within a foreman's department have to him the appearance of an appropriation of his prerogatives, because it has previously been his responsibility to care for equipment and in many cases also to act as "rate-setter." He will likewise so regard the removal of the control operations—routing, scheduling and so on—from the shop to the planning department.

And all these are indeed encroachments on an established relationship. But they are in the interest of a better result, and no real foreman will deny his interest in a better result. In the beginning it may and probably will be impossible to convince him of the desirability of the new plan complete in all its details; but if he is a good man, the natural challenge of seeing a better result attempted will incline him to give the new plan a chance. It can be stated here that the foreman's reaction to these developments is a reasonably good index of his real ability.

Painstaking effort to develop an acceptance of principles on the part of the foreman and other supervisory agents of his rank must be regarded as essential. Their good will at the outset is a requisite, and preparations cannot be considered complete without it; for it must be remembered that in the eyes of the workers the foremen represent the management, and a front of unified approval of any plan contributes largely to its success even where other obstacles of magnitude exist.

It has already been stated that the foremen group at the Acme Wire Company did not originally have the same enthusiasm for scientific management development that the plant management had, and that this situation was made still more difficult because a cumbersome detail of system affecting the workers grew up, and the absence of previous cost records made impossible exact comparisons. But it was also shown in the course of time, that in the intermediate position between management and worker the foreman was oftentimes enabled to make rational judgments which were very helpful in matters of technique.

As already indicated, the approval of the immediate supervisory groups will deliver a substantial advantage for any plan with respect to the receptivity of the workers. In the beginning stages the cultivation of a corresponding attitude on the part of the more progressive element in the labor group itself should be systematically undertaken and carried out. In the course of time through the issuance of routines, contact, and experience all will know the purpose of the plan, but it is necessary to have them appreciate it as completely and as quickly as possible. Such a result is inspired by the sympathetic interest of those who, though workers, have established a natural position of leadership, and is well illustrated at this company by the first worker set to task, whose performance and leadership, already described, stimulated the entire surrounding group.

In transactions of this sort it is likewise important to be concerned about the personal characteristics of those who carry to the workers the management's plans to institute new control methods. A person charged with such a responsibility naturally has the confidence and respect of the management whose delegate he is, but it is even more important that he be able to acquire and command the whole-hearted regard and respect of the workers who will be affected. Operators who like and respect a representative of management are not disposed to question his motives or criticize his plans.

The individuality of the worker must not be permitted to be submerged in the system. Assuming an original skepticism by reason of natural reluctance to change, it is but addition of insult to injury to impose upon the worker details of control procedure that cannot be fairly justified as suitable means to the end of getting productive work done. Unless caution is exercised in that respect, there is danger that there may be a shift of emphasis to the devices themselves, as means of keeping the control plan operative rather than having it remain on the purpose of the devices—waste elimination, increased productivity and increased earnings. At the beginning of the writer's experience with this development there were a hundred and twenty people in the central planning room, and fifty more in the cost department, all more or less engaged with details that involved ticket handling by direct operatives. It was a great annoyance at the time, and in after years it was amusing to recall that the operators, inspectors and move men often co-operated in a wholesale disregard for batch numbers on the tickets issued by the control board. They would select any corresponding lot and go to work on it. As a result the bulletin board clerk oftentimes spent two or three hours after the factory closed down at night, moving lots around to positions which the bulletin board showed they should occupy. The real trouble was that the units of work were too small, and the workers disliked the annoyance and delay between lots. Now the planning department is reduced to ten people, payroll computation including bonus for the whole plant is done by one clerk, and the cost department on the old basis is entirely eliminated by standards cost accounting.

Proper recognition of the worker's abilities is essential. Since this can be done only to a definite limit by promotion in position, other methods have to be considered. An operator's reliability, interest in work, ingenuity in producing helpful suggestions, a willingness to be trained and ability to perform a considerable range of related operations may all be recognized by differences from the base rate of pay established for a normal measure of these attributes. For an operator to be able to perform half a dozen operations, each one requiring some training, yields a flexibility of facilities and an advantage to the management which, under the principle of the division of advantage, should be shared by both parties. There need be no difficulty in the existence of a variety of hourly wage rates on any job if the basis of its existence is understood and all may partake who qualify.

This experience stretching over a period of more than ten years demonstrates that so far as the workers are concerned, a plan of development will always proceed satisfactorily, provided it is designed to give as well as to take; is sufficiently deliberate in its handling to permit understanding; is accurate in its detail, and not too cumbersome in its technique; is presented by those who command respect and is supported by a management which includes in its conception of scientific management a readiness to make changes whenever new and better ways are found and a willingness constantly to try to find those ways. Under these circumstances the experience at this plant and at another plant in western New York, together with intimate observations of other situations under development, lead the writer to the firm conviction that workers are not fundamentally opposed to the principles and procedures of scientific management, but are, on the contrary, naturally responsive and readily appreciative.

II. Experience in a Union Shop[5]

The early developments of scientific management years ago came at a time when there was generally a marked distrust of management by labor. The mass solidarity of labor and instances of concerted deception of management practised by workers, so graphically described by Taylor, were an inevitable consequence of management's attitude toward labor—an attitude which assumed labor to be a commodity, governed it arbitrarily and by rule of thumb, believed that labor should produce what it could be forced to produce, but should be allowed to earn no more than a prevailing standard of wages, and cut piece rates ruthlessly if higher earnings resulted from stimulation of exertion. The natural reaction of workers was one of resentment and resistance, which frequently in union shops took the form of strikes if protests bore no fruit, and in non-union shops took the more subtle form of sabotage.

Appearing in the midst of such conditions—as a protest to these attitudes of both management and workers and as a remedy for them—scientific management experienced the opposition of both parties, as was bound to be the fact with respect to anything new which challenged the assumptions of both. The opposition of management to the technique has gradually been overcome, as is evidenced by the fact that scientific management has become the effective basis of all good management throughout American industry; although survival of management's opposition is still apparent in the fact that many a plant which has been revolutionized by scientific management refuses to acknowledge the source of the revolutionary influence.

If such has been the attitude of management, it should not be surprising that the attitude of union leaders toward scientific management was at the beginning and for sometime thereafter, positively hostile. Without special investigation of its mechanisms and their consequences for workers, union leaders denounced it as a doctrine and a system of practice. The American Federation of Labor under the leadership of the late Samuel Gompers assailed the introduction of the system in the government navy yards and succeeded in having the Congress specifically prohibit the use of the stop watch and all that went with it in the government plants. It is only in the past few years, toward the end of Mr. Gompers' life and especially since the accession of Mr. Green to the presidency of the American Federation of Labor and the stressing of the "human engineering" point of view by leaders of the Taylor Society, that a general appreciation of the broader aspects and the social benefits inherent in scientific management has gained ground and produced a profound change in the attitude of the leading spokesmen of organized labor in the United States.

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[5] By Dr. N. I. Stone, Industrial Councilor, New York; formerly General Manager of the Hickey-Freeman Company, Rochester, N. Y.

It was against this background of general suspicion of and hostility to scientific management that the writer made his first attempt to introduce it in the clothing factory of the Hickey-Freeman Company in Rochester, New York, employing at the time about 1200 workers in a modern plant. Not only was it necessary to take into account the hostile assumptions of the workers, but the management had also to be convinced of the desirability of the change.

The officers of the company were frankly skeptical, willing to be shown but ready to discard the new system unless it proved to be a decided improvement over the old and well tried system which, no matter what its theoretical shortcomings might be, had enabled the company to grow and prosper over a period of some twenty years.

The foremen, with one exception, were openly in arms against the new system; partly from a natural conservatism of men who had grown up under the old regime and knew only one way of running a shop, and partly from a feeling that their authority over the workers and security of position with the firm were likely to suffer as the new management succeeded in introducing a system in which they would be playing the part of novices.

It was therefore necessary to proceed with extreme caution and to take account of the psychological situation. The greater part of the first year of the writer's incumbency as labor manager of the company was spent in consolidating the relations between the company and the workers as well as their union. The writer's appointment as labor manager coincided with the official recognition of the Amalgamated Clothing Workers of America by the employers. This recognition came about as a result of negotiations without resort to strike, and the employers felt that they ought to derive some benefit from the resultant good-will. On the part of the union and its members there was a feeling that after the many years of comparatively low wages prevailing in the clothing industry of Rochester they were entitled to tangible benefits from the new order of things. The recognition of the union was signalized by a general increase in wages and a reduction of hours to forty-four per week. This took place on April 1, 1919. The year that followed marked the culmination of a period of unusual business activity and extraordinary demand for labor which resulted in great increases of wages even in non-union plants as the only means of retaining the services of their help. The unionized clothing industry of Rochester felt the effects of the general situation and two general increases of wages followed the one granted April first. In addition to the general increases of wages there were numerous increases of wage rates for individual workers paid by the week, which they were able to exact by claiming that they were offered higher wages elsewhere because of the prevailing shortage of labor. These cumulative increases resulted in advancing the wages of Rochester clothing workers from 50 to 100 per cent in less than one year. But they coincided with an equal if not even greater increase in the cost of living so that they failed to satisfy the workers who were constantly demanding more. The enormous increase in labor costs, coupled with similar increases in the cost of cloth and other raw materials, resulted in a corresponding rise in the price of clothing which forced consumers to economize, leading finally to the famous "buyers' strike." The first rumblings of the approaching storm were beginning to be heard.

It was at such a moment that the workers received their first introduction to scientific management in the Hickey-Freeman plant. The writer knew that the first steps in the process would be viewed by them with particular apprehension and suspicion, and that the only way to disarm suspicion and secure co-operation was to show them in unmistakable manner that they would be the first to benefit by the change.

As soon as the dispatch station was ready for operation, the writer addressed the workers of that shop. He pointed out to them that repeated increases in wages without a corresponding increase in production were not benefiting the workers, as they were being offset by rising prices to which manufacturers had to resort to make up for the increased cost of production. The only way to break the vicious circle was to bring about an increase in earnings through increased production, which would mean a lowering of production costs without which a reduction in the constantly mounting cost of living was impossible. The dispatch station and all that would follow it were intended to help increase production through elimination of waste of effort and materials, through insuring a steady flow of work, standardization of materials and methods of performing various operations.

I knew that mere assertion would not get very far with the workers and was therefore careful to see that the first changes to which they would have to submit should have their compensating advantages, as the following illustrations will make clear.

Under the old system, work was distributed to the workers throughout the shop by the foreman and his assistant. The worker had no occasion to rise from his or her seat from morning to night as long as there was work to do. Under the new system each worker was given enough work to last about an hour and was required to take it to the dispatch station and receive a new supply of work. This would mean an hourly interruption in work and a loss of from two to five minutes. Piece workers accustomed to the old ways would surely object to the change.

Under the old system it was impossible to keep track of the time it took to do each piece of work either by piece or week workers. The dispatch system provided a convenient means for recording the time taken to do each piece of work whether it was paid for by the piece or by the hour. Both piece and hour workers would naturally object to this, as it would enable the management to "know too much" about the relation of time and output.

Again, piece workers were accustomed to do very much as they pleased in the matter of attendance. They were not required to ring the time clock either on coming in the morning or leaving in the afternoon, since they were not paid on a time basis. Under the new system it was necessary and feasible to have a record of their attendance. This was going to make it possible for the management, for the first time, to know whether low earnings were due to short time spent in the shop or to other causes, and this naturally was not to the liking of the piece workers. These few illustrations will show that there were sufficient legitimate as well as illegitimate reasons for objections to the new system by the workers, and the writer set himself the task of offsetting them by definite gains to the employes.

One of the most fertile sources of loss of earnings to the piece workers was idle time caused by irregular flow of work. Under the prevailing system of division of work it takes no less than 125 operations to make a coat. In a shop employing only 250 workers there will be an average of two workers to an operation and there will be several operations employing but one worker each. The absence of one worker employed on such an operation will cause a deficit of from 50 to 100 per cent in the output of the shop on that one operation. As soon as the accumulated reserve of work in the shop on that operation has been used up, all work will have to stop on operations following the one on which the absent worker is employed.

Under the old system workers were accustomed to these interruptions because of lack of work, and the piece worker took it as part of the hazards of piece work, trying to make up for lost time by demands for higher piece rates. Under the new system of planning and dispatching of work the management expected to eliminate or to reduce to a minimum interruptions of this kind. However, it would not have been reasonable to expect the workers to share that expectation as they knew nothing about scientific management. All they did see were some of the obvious disadvantages to them, as indicated above.

It was therefore decided to offer the workers an improvement over the old order of things in the form of payment to piece workers for idle time. The new rule provided for payment at the rate of 65 per cent of the average hourly earnings of the piece worker. Under the old system, there being no time records for piece workers, neither the worker nor the management knew accurately what the hourly earnings of piece workers were. In order that we might know it now, it was manifestly necessary for every piece worker to register the time of his arrival at and departure from the shop, and to have him report at the dispatch station when receiving and returning work, so that a record could be made of the time work was given out and received. Payment for idle time was something unheard of before—something that even the union had never asked for—and therefore it made a profound impression upon the workers. It was a concrete illustration of the benefits from the new system that accrue to the worker.

It called for a great deal of patience and faith in the new management, on the part of the members of the firm, for in addition to the great expense involved in the introduction of the new system, it now had to submit to a totally new item of expense in the form of idle time which in the first year amounted to several thousand dollars. It may be said in passing that the very presence of the item of money paid for idle time in the weekly shop reports served to act as a sharp reminder of the imperfections in management that caused idle time. At meetings of the production staff it served as the starting point for discussions of causes of idle time and means of their elimination. Step by step the factors interfering with the steady flow of work were attacked and eliminated or minimized as far as was possible, until payment for idle time became so negligible as to be hardly worth noticing.[*] But it helped to draw attention to and to do away with numerous sources of waste which in the aggregate far exceeded the amounts paid the workers for idle time.

The loss of time caused by the hourly walk to the dispatch station was more than made up through the physical benefit derived by each worker from the hourly change of position from a sitting posture, the relaxation derived from the walk to and from the station, and rest from work. This average loss of two to three minutes, or about fifteen minutes per day, was found to be even more effective than the ten minute physical exercises practised in the middle of the afternoon in many modern plants. As a matter of fact, the records of output of both week and piece workers showed that not only was there no falling off of production, but that production actually increased under the new system, fully bearing out the expectations of the management.

One of the means of preventing idleness among workers through the absence of one or more workers on a certain operation, is to train each worker to do more than one operation. The old-time tailor could make the whole coat, but under the system of division of labor, each worker specializes in but one operation out of more than a hundred.

The writer shared the feeling generally prevailing among economists, sociologists and social workers, that this extreme specialization causes great monotony in the worker's life from which he would be glad to find relief. Therefore when it was decided to provide training for employes so as to teach them to do more than one operation, no opposition on the part of the workers was looked for. In fact, the writer believed that the workers would gratefully embrace the opportunity of breaking the monotony of working at one operation all the time, the more so that it offered several economic advantages to them. To know two or more operations enabled the worker to earn more money while learning a new operation than the 65 per cent which he received while sitting idle; and it offered the workers greater certainty of employment with his present firm or greater ease of finding employment with a new firm when looking for employment; and he had the satisfaction of knowing that by being able to take the place of an absent worker he was thereby saving dozens of his fellow employes from temporary idleness and loss of wages.

One can therefore easily imagine the surprise of the management when it was found that the workers were strongly opposed to training in spite of the fact that they were paid while being trained. The reaction was a purely psychological one. Most of the workers to be trained were women. The repetitive character of each operation on which they were employed enabled them to perform it almost mechanically with a minimum of attention and of mental concentration, leaving them free to carry on conversations with their neighbors to the right and to the left while going on with their work. Learning a new operation called for mental effort, hurt their pride in being placed in the position of novices or apprentices, and in general, upset a well established mental, physical and psychic equilibrium which they hated to have disturbed. So strong was their opposition to being taught new operations that they preferred to sit idle even if not paid for idle time, rather than take the trouble of learning a new operation at the expense of the firm.

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[*] It declined to one-fourth to one-half of 1 per cent of the payroll.

The difficulty was only partially overcome through persistent effort on the part of the management with individual workers. The majority clung to their old operations. The whole experience showed the profound difference in the psychology of mental and manual workers, and how wrong we are in assuming that the workers suffer from the monotony of their simple repetitive operations. The very opposite appears to be the case. The nature of intellectual work is such as to require mental concentration, and if of a repetitive character, it becomes monotonous and therefore irksome, causing one to seek variety. Manual work, on the other hand, when once thoroughly mastered, can be done with almost no mental concentration, enabling the worker to dream or talk to his fellow workers, so that he is unconscious of monotony and prefers the rhythm of a repetitive operation to the mental effort required by changes in work.

From the foregoing account it will be seen that the workers' reaction to the introduction of scientific management called for much patience and tact. In spite of frank explanations of objectives sought, through talks to the rank and file of the workers and through conferences with union and shop leaders, and in spite of monetary advantages which the workers derived immediately upon the introduction of the new system, the hostile influence of a few aggressive leaders, whose suspicious natures and prejudices against management on general principles prompted them to see cunning traps in every advantage offered to the employes, was sufficient to arouse opposition at every step when difficulties inseparable from the installation of a new complex system in a busy plant arose from time to time. It took the better part of a year to overcome the workers' suspicions through the practical demonstration of the superiority of the new system and its advantages to the workers as well as to the firm.

Today, after more than eight years of operation, scientific management as expressed in planning and dispatching of work, time studies, written specifications of standards of quality, and concentration of production control through the dispatch system which relieves the foreman of a duty which formerly took most of his time and sets him free for supervision of quality for which he is best fitted, is so firmly and successfully established that its most pronounced critics both in the executives' and workers' ranks would not think of suggesting its elimination and going back to the good old days of hit and miss.

THERE is no place for conflict in the economic world, nor for its twin evil, class superiority. There is but one economic man and one group of economic forces. Those who make for efficiency make also for the improvement of all other ennobling qualities. . . . . The unskilled worker must be transformed into an efficient citizen; the irregular trades into which marginal men flock must be safeguarded so that they will stimulate and elevate the worker instead of lowering his life and vitality. Children must be kept from work and women must have shorter hours and better conditions. Men can thus be moved from the margin and an equality secured through the more generous return which the new situations give. By this means the incomes and personal efforts of those favorably situated can reduce the evils of poverty without the destruction of the advantages upon which their welfare and the progress of society depend. The nation can gain economically by moving forward. (Simon Nelson Patten, *Essays in Economic Theory*, pp. 238, 257-258.)

A Technique in Employment for Subexecutive Positions[1]

A Method of Measuring Personality Factors in an Individual and Comparing Them with Job Requirements

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THE function of this paper is not to discuss the entire field of employment procedures, but principally one phase, and a technique which holds promise of illuminating that phase. This refers to the personality and fundamental nature and aptitudes of the individual as distinguished from his knowledge, technical experience, skills and environmental situation. It covers much of the information and impressions usually sought in the personal interview, and while it is not intended to supersede the interview it aims to qualify and quantify the individual's characteristics in a more definite way than usual. While the full technique is at present best applicable to the hiring of employes of the more intelligent class, such as recent college graduates and others of potential executive calibre, some of the principles and methods involved have more extensive applications. Some explanation will be made of the detailed principles behind this technique so that others can experiment with it, and if they find it valuable, adapt it to their own needs.

What we are primarily seeking are organized differentiation and approximate measurement of the individual's innate desires, aptitudes, and interests; of his present beliefs, attitudes, ambitions, preferences, and temperamental predilections; of his evolving adaptability to people and to changing conditions. Can we secure and organize at least part of this information in such a way as to supplement the findings of the interviewer; and at the same time secure other data of value?

The hopeful angle of approach would seem to be a psychological application of the engineering approach, and perhaps we may say, of the Taylor principles.

"Scientific management," says Taylor, "involves the substitution of exact scientific investigation and knowledge for the old individual judgment or opinion, either of the workman or the boss."[2]

Person, in elaborating this principle, says, "Scientific management aims . . . to assure the highest opportunity for individual capacity through scientific methods of work analysis and of selection, training, assignment, transfer and promotion of workers."[3]

The assent of the psychologists to this position and a statement of their point of view was well expressed by Bingham before the same Congress. "In essence," he says, "this point of view consists in a more than ordinary tenacious belief that human experience is understandable, that human behavior is not a spiritual mystery but a natural phenomenon like other phenomena of the organic world. Such a belief leads to the persistent attempt to understand one's fellows, to appreciate their motives and ambitions, to comprehend their shortcomings and their possibilities," and further "it pays in the long run to attempt to understand the deep-lying motives and ambitions of people, and to work with the current of human nature, rather than counter to it. It (psychology) has made this point of view explicit in its application to problems of vocational adjustment, including placement and training, in conformity with the individual's proclivities and talents."[4]

I like to think of the engineering approach to human nature as an earnest search for the units of material and force which are the indivisible factors in the structure. Given units, the engineer can analyze, measure, synthesize and adapt. If we can first find or make some approximation to any units in human nature we shall have taken a long step toward bringing about the aims of psychology and of scientific management.

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[1] Paper presented before a meeting of the Taylor Society, New York, December 7, 1928.

[2] Copley, Frank B., *"Frederick W. Taylor, Father of Scientific Management,"* New York, Harper & Brothers, 1923, Vol. I, p. 12.

[3] Person, H. S., "Scientific Management, an Analysis with Particular Emphasis on Its Attitude Toward Human Relations in Industry," *Bulletin of the Taylor Society,* Vol. XIII, No. 5, October, 1928, p. 202.

[4] Bingham, W. V., "Industrial Psychology," *Bulletin of the Taylor Society,* Vol. XIII, No. 5, October, 1928, p. 193.

Psychologists are pretty generally agreed that the three emotions observable in earliest infancy are basic and unresolvable into simpler factors. In other words they are actually units within our present meaning. These have been termed fear, anger and love, although in our employment vocabulary we shall want to use somewhat milder designations, such as caution and fighting spirit, for example. Later on other types or categories of behavior appear which seem, at least for our practical purposes, to be also unresolvable into simpler forms.

As personal characteristics we may refer to them merely as "units" in the personality. But personality can only be analyzed and measured through an appraisal of behavior or response. In action, therefore, we refer to these "units" as categories of behavior, or simply as unit or basic categories.

There also become evident in our examination certain aptitudes which are essentially intellectual in nature; such as numerical ability; certain special aptitudes, such as the mechanical group; and certain physical aptitudes, such as quick reaction times and various types of dexterity. These latter are pertinent to the subject of employment, but they are mostly appraisable successfully by psychological tests and will not be elaborated upon in this study of personality.

Then there are terms like "initiative" which has been treated elsewhere[5] and shown to be decidedly complex in its nature. In general the criterion assumed for a "unit" or basic term or category is that in common business and industrial parlance it cannot be expressed in two or more simpler terms or categories.

However, as opinions may differ and as psychological theories may be at variance with industrial usage, the logical course is to add to the original three an assumed set of basic categories which appear to be in accordance with common sense and practical experience, and then to try them out. If a large amount of vocational and personal behavior can be adequately expressed in these fewer and simpler terms, we have the first pragmatic evidence of a useful set of the engineer's "units of material and force."

The next step is to develop methods of appraisal of each of these in a given individual. Here his past behavior is the key to his future behavior and it becomes necessary to present typical situations which will bring out as nearly as possible the average strength of his responses within the given category. This is done in the present technique by means of a questionnaire, as explained later. If statistical procedure gives further evidence of the appropriateness of the units and the questions we may take it as a working hypothesis that we are on the right track.

Psychologists have for some time been earnestly attacking the problem of measuring occupational preferences, mental attitudes, personal tastes, various likes and dislikes and volitional tendencies. Although the reliability of the results has been admittedly rather low thus far, useful and valuable data and methods have been obtained. This technique is an attempt at a further contribution directly applicable to industry's needs.

Reverting to our proposed list of units, the first was caution, fear being merely the extreme expression. Whether a man has much, average or little caution often makes a great difference in his aptitudes for a particular job and his success in it. Nature has endowed most people with at least a minimum of caution as a means of achieving self-preservation for the individual and therefore for the race. But a man who was excessively timid would never be happy as a boss in a powder mill, and a person who was extremely reckless would hardly make a good captain for an ocean liner. Caution has its place, but unfortunately it is at best rather a negative quality. However, it obviously works in conjunction with many other human feelings to produce a varied assortment of useful attitudes and actions.

Anger, the second on the list, is of course the extreme expression of fighting spirit. The combative instinct is present in a greater or less degree in all of us. When this rises to real heights, due perhaps to the encroachment of someone else, there may be an explosion. If there is not, it is a tribute to our self-control—or perhaps even to our caution—more than an evidence that we are not really angry.

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[5] Hull, E. Hayden, "Management Psychology a Joint Responsibility," *Bulletin of the Taylor Society*, Vol. XIII, No. 2, April, 1928, p. 95.

Fighting spirit, contrary to the situation regarding caution, is one of the great dynamic forces in constructive industrial and business success. There are even occasions when it pays to get angry and show it. Granted that this is rare, a greater or less degree of fighting spirit itself is usually a distinct factor in a highly successful executive career and in many forms of dynamic accomplishment. But the proportion must be suitable to the job in view. The president of a corporation in a highly competitive line needs a generous portion, while the head of a minor clerical department may well have rather less than average.

The province of the third elemental impulse, love, we shall not invade in this paper.

Having considered all the unimpeachable information as to which human emotions are really basic, we shall have to follow some other course to increase, at least tentatively, our list of units in human engineering. There are hundreds of variables in human nature. Some, in addition to the original three, are presumably elementary.

It would seem reasonable to suppose that the common judgment of centuries on human nature might have some authentic value. This judgment is expressed in our language itself. Various manifestations of human nature—or forms of behavior, or types of response, if you prefer—have been given names which have come to be generally understood and used as designating particular categories of human expression. Thus, when we say that a man is habitually "cautious," we are in effect saying that in his normal range of action he exhibits the particular manifestations of caution which the situation calls for, and in a degree which is habitually greater than the "average" man would show. But the differences are only in degree or mode of expression of the same fundamental or "unit" quality in human nature. Common usage has arrived at no simpler or more basic category, and in this case the conclusion has been verified by modern scientific investigation.

Similarly we say, with reference to intellectual or special abilities, that a man is "good at figures" or has a "very analytical mind," or "unusual mechanical ingenuity" because our experience with him has shown us that he is above the average in these respects. In these latter cases we have already developed, by scientific investigation and statistical method, means of telling just how high he rates as compared with the general population. There seems to be no reason for treating fundamental characteristics of personality any differently. It should be possible to measure the amount of each, at least approximately, and to predict probable future behavior under appropriate circumstances. If this be true we can get data with a wide variety of usefulness.

A list of presumable "unit" or basic terms which have been found practically useful in expressing and evaluating a wide variety of personal characteristics, and which have some statistical confirmation as to their validity is shown in the first column of Figure 1. The words in parenthesis are explanatory, or more or less synonymous, and have been added to illuminate the connotations of the term. Further explanation will occur in the context.

It is rather difficult to express any of these terms in two or more simpler terms. Some of them have one word to express the inner feeling and another, or others, to designate typical outward expression, but these seem to be co-ordinate expressions of the same integer, not two or more component parts. Thus, the basic undifferentiated inner feeling corresponding to self-reliance is probably self-esteem. The man who does not think much of himself can hardly exhibit much self-reliance. We prefer in general to use the term self-reliance because it can more readily be expressed in terms of objective behavior. On the other hand for purposes of analyzing compound characteristics into their unit factors, the term expressive of the inner feeling is sometimes from the very nature of the problem more descriptive. In many cases usage applies the same term to both the feeling and its generic mode of expression.

The welter of words which is avoided by the use of a basic term is illustrated in Figure 2. Here three degrees of power in each of three general situations are listed, with a special term appropriate to each, though all are based on the single unit term. The latter term is all that should be necessary. If the employer knows whether the man is habitually high, low or medium in this he can apply the information to the job situations much more rapidly, and probably much more accurately,

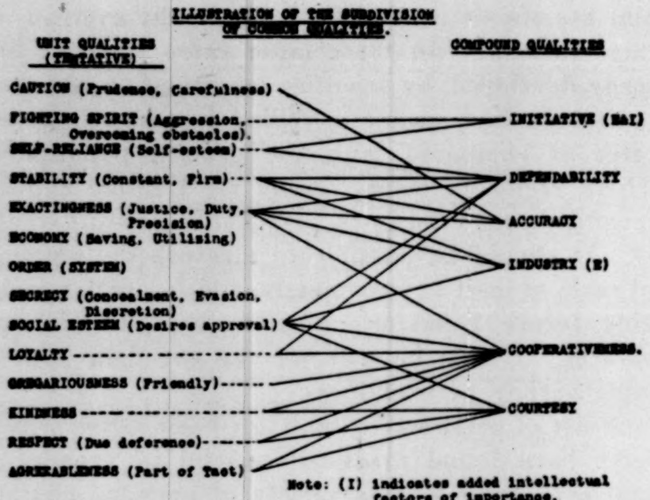


ILLUSTRATION OF THE SUBDIVISION OF COMMON QUALITIES.
UNIT QUALITIES (TENTATIVE)
COMPOUND QUALITIES
CAUTION (Prudence, Carefulness)
FIGHTING SPIRIT (Aggression, Overcoming obstacles).
SELF-RELIANCE (Self-esteem)
STABILITY (Constant, Firm)
EXACTINGNESS (Justice, Duty, Precision)
ECONOMY (Saving, Utilizing)
ORDER (SYSTEM)
SECRECY (Concealment, Evasion, Discretion)
SOCIAL ESTEEM (Desires approval)
LOYALTY
GREGARIOUSNESS (Friendly)
KINDNESS
RESPECT (Due deference)
AGREEABLENESS (Part of Tact)
INITIATIVE (E&I)
DEPENDABILITY
ACCURACY
INDUSTRY (E)
COOPERATIVENESS.
COURTESY

Note: (I) indicates added intellectual factors of importance.
(E) Indicates an energy factor.

Figure 1

ILLUSTRATION OF THE VERBIAGE AVOIDED BY RATING ON BASIC QUALITIES ONLY.

TYPE OF BEHAVIOR	DEGREE	SELF ESTEEM	KINDNESS
GENERIC EXPRESSION OF THE PERSONAL CHARACTERISTIC.	When normal	Self reliant	Altruistic
	Too strong	Egotistic	Self-abnegating
	Too weak	Dependent	Self-centered
BEHAVIOR TO ASSOCIATES	When normal	Takes lead	Helpful
	Too strong	Opinionated	Self-sacrificing
	Too weak	Acquiescent	Selfish
BEHAVIOR TO SUBORDINATES	When normal	Takes responsibility	Kindly
	Too strong	Domineering	Paternalistic
	Too weak	Passes buck	Inconsiderate

Figure 2

than he can think up, or use, appropriate verbiage in every case.

The analysis of compound qualities into their unit components is a different matter. Here, as in the case of initiative, previously referred to, we have to work out from experience and common sense the principal factors which are usually present in a manifestation of the compound quality. And in any particular job situation there may be more or fewer major elements than the number generally assumed. There are hundreds of these compound terms, but most of them can be rather readily reduced to their unit elements. Some tentative examples are shown in Figure 1. The pervasive unit or basic characteristics in courtesy, for instance, seem in general to be kindness, agreeableness and respect, with social esteem as a further motivating influence. but each job has its own desirable proportion of these units.

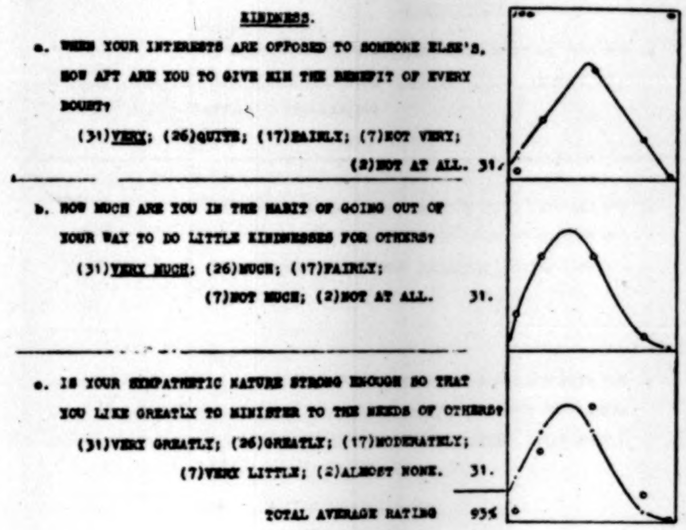
If we accept the list of units in Figure 1 as a starting point, we can pursue our problem as a true one in human engineering. The next question is the practical one of measuring the strength of each of these qualities in a given individual, for comparison with the requirements of the job in question.

For this purpose a personal history questionnaire is organized. It embodies the usual information but is longer than the usual experience sheet and contains the following additional feature. For each basic characteristic on which a rating is desirable, several simple questions are asked involving appropriate situations. Five alternate degrees of response to each question are indicated for checking. If the question is good and the answer is honest and intelligent, we have, by combining the results numerically, some measure of the normal strength of the individual's response in that particular category; and so on for each one. This approximates the measurement we are seeking.

The next problem is to get people actually to answer the questionnaire, and to answer it honestly and intelligently.

It now begins to be clear why the present application of this technique for purposes of original employment is best adapted to the class which we may call subexecutive. The laborer probably cannot answer the questions, and the candidate for president will not. It makes no difference that it would probably be one of the most illuminating experiences of his life; he is too "big" for that sort of thing. Meanwhile we have to apply it where we can. Even in the middle register, circumstances are more favorable for it in some places and conditions than in others. The most impartial answers are usually obtained where the man can be made to see that employment is a mutual experiment with failure disastrous to both sides, or where the man is himself at sea, as in many cases of prospective reassignment.

In framing these questions and alternative responses for your own purposes, there are several things to be considered. The question must set up a situation which is within the range of the individual's ordinary experience. It must be simple and disarming in character. Factors involving



KINDNESS.

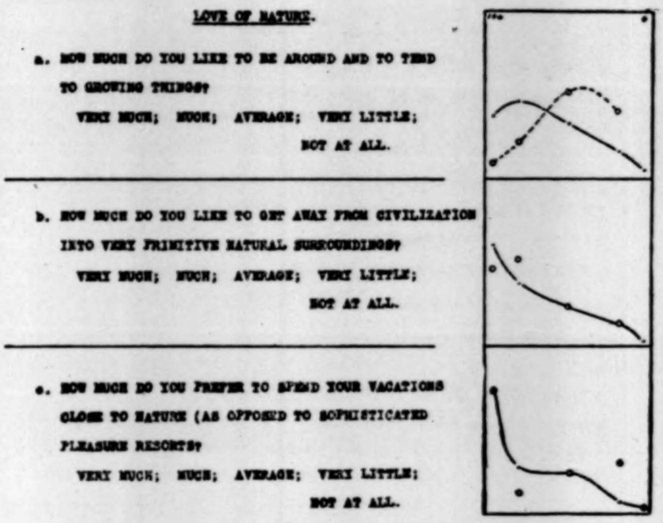
a. WHEN YOUR INTERESTS ARE OPPOSED TO SOMEONE ELSE'S, HOW APT ARE YOU TO GIVE HIM THE BENEFIT OF EVERY DOUBT?
(31)VERY; (26)QUITE; (17)FAIRLY; (7)NOT VERY;
(2)NOT AT ALL. 31.

b. HOW MUCH ARE YOU IN THE HABIT OF GOING OUT OF YOUR WAY TO DO LITTLE KINDNESSES FOR OTHERS?
(31)VERY MUCH; (26)MUCH; (17)FAIRLY;
(7)NOT MUCH; (2)NOT AT ALL. 31.

c. IS YOUR SYMPATHETIC NATURE STRONG ENOUGH SO THAT YOU LIKE GREATLY TO MINISTER TO THE NEEDS OF OTHERS?
(31)VERY GREATLY; (26)GREATLY; (17)MODERATELY;
(7)VERY LITTLE; (2)ALMOST NONE. 31.

TOTAL AVERAGE RATING 93%

Figure 3



LOVE OF NATURE.

a. HOW MUCH DO YOU LIKE TO BE AROUND AND TO TEND TO GROWING THINGS?
VERY MUCH; MUCH; AVERAGE; VERY LITTLE;
NOT AT ALL.

b. HOW MUCH DO YOU LIKE TO GET AWAY FROM CIVILIZATION INTO VERY PRIMITIVE NATURAL SURROUNDINGS?
VERY MUCH; MUCH; AVERAGE; VERY LITTLE;
NOT AT ALL.

c. HOW MUCH DO YOU PREFER TO SPEND YOUR VACATIONS CLOSE TO NATURE (AS OPPOSED TO SOPHISTICATED PLEASURE RESORTS?
VERY MUCH; MUCH; AVERAGE; VERY LITTLE;
NOT AT ALL.

Figure 4

characteristics other than the basic one in question must be excluded as far as possible and enough questions must be asked on the same category to insure a presumably fair "average" response. The questions must be adapted to the group to which they are administered. The words used to indicate the alternative degrees of response must be chosen and rated with reference to the circumstances of the group and the total situation. The questions must, as far as possible, be objective or at least factual. They must call for no explanation or interpretation of behavior, but only a statement of degree of present or past reaction to the circumstances presented. The phraseology must be clear and the description of the situation must be so impartial and well chosen that there is no tendency to stampede to one end of the scale or the other.

The first test of the actual validity of the questions themselves is the combined judgment of a number of competent people as to their appropriateness to the category in question. The second test is in the deviations found in the answers. If one question in a group of three bearing on the same quality is usually marked low by the people who mark the other two high, there is something the matter with it.

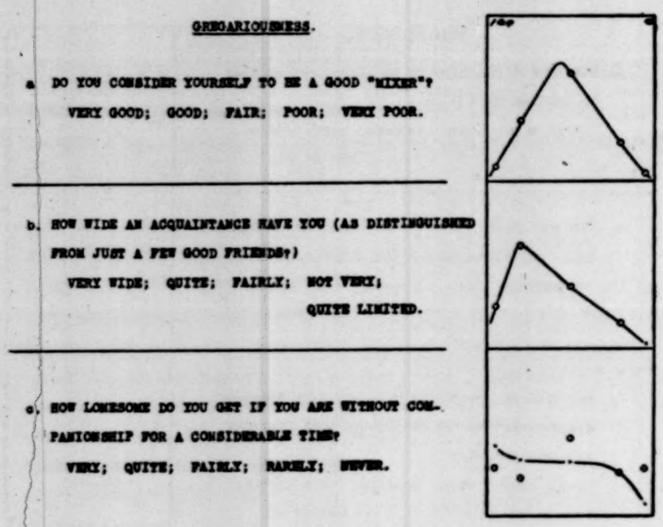
The third test is in the distribution of the answers of a large number of people to each question. These should follow the normal distribution curve when platted, or give a slight skew which may be expected under the circumstances.

The fourth test is whether the curves in the same category have all approximately the same character. If one is decidedly dissimilar to the rest — for example, if it has an opposite skew — the question should usually be changed.

The reliability of the questions, or the consistency of their performance in measuring whatever they do measure, was tested in two ways. First, they were tried on the same people on successive occasions to see whether they consistently rate the same question in the same degree. Self-rating on personal qualities by name is notoriously erratic. By making the questions more factual and objective much better results are obtained. Second, the reliability was tested by the method of sectioning. Two sections of the group were platted as separate sets of curves. When the correspondence between these was close—in most instances—high reliability was indicated.

Several illustrative examples of questions and their resulting curves are shown in Figures 3 to 7. The full curves in this particular case represent a miscellaneous group of 140 students distributed in twelve colleges. The circles show approximately the corresponding points for forty-one engineering students. These groups, furnishing about 40,000 items of quite homogeneous data, present several advantages from the standpoint of a statistical check on the correctness of the principles of the technique. The context of individual questions may, however, vary with different employment situations.

Figure 3 shows three questions on kindness which may be classed as generally good. The first curve shows fairly normal distribution of the an-



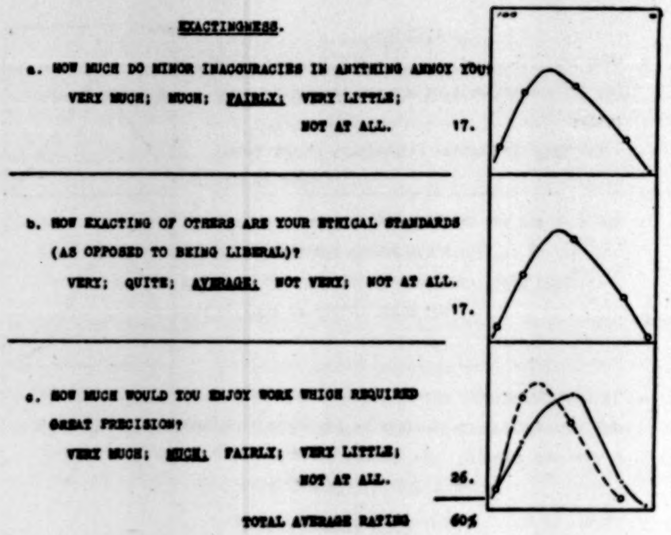
GREGARIOUSNESS.

a. DO YOU CONSIDER YOURSELF TO BE A GOOD "MIXER"?
VERY GOOD; GOOD; FAIR; POOR; VERY POOR.

b. HOW WIDE AN ACQUAINTANCE HAVE YOU (AS DISTINGUISHED FROM JUST A FEW GOOD FRIENDS?)
VERY WIDE; QUITE; FAIRLY; NOT VERY; QUITE LIMITED.

c. HOW LONESOME DO YOU GET IF YOU ARE WITHOUT COMPANIONSHIP FOR A CONSIDERABLE TIME?
VERY; QUITE; FAIRLY; RARELY; NEVER.

Figure 5



EXACTINGNESS.

a. HOW MUCH DO MINOR INACCURACIES IN ANYTHING ANNOY YOU?
VERY MUCH; MUCH; FAIRLY; VERY LITTLE; NOT AT ALL. 17.

b. HOW EXACTING OF OTHERS ARE YOUR ETHICAL STANDARDS (AS OPPOSED TO BEING LIBERAL)?
VERY; QUITE; AVERAGE; NOT VERY; NOT AT ALL. 17.

c. HOW MUCH WOULD YOU ENJOY WORK WHICH REQUIRED GREAT PRECISION?
VERY MUCH; MUCH; FAIRLY; VERY LITTLE; NOT AT ALL. 26.

TOTAL AVERAGE RATING 60%

Figure 6

swers. The second and third show a skew toward the high side, but a careful reading of the questions indicates that this is to be expected from the socially educated group usually found in colleges. The social element does not enter into the first question so strongly. The method of scoring by giving direct percentage (approximate) is shown.

Figure 4 shows a complete failure and is commented on later.

Figure 5 is given to illustrate good, poor and bad questions bearing on the same basic characteristic. The fault with question (b) is probably that the criterion of what constitutes a wide acquaintance is itself a variable. Question (c) evidently involves several variables. Neither of the latter should be used.

Figure 6 is chiefly interesting on account of question (c). This and several other cases, most of which are not given here, seem to show a distinct differentiation for the engineers, and this in a higher degree than appears explainable on the ground of statistical probability.

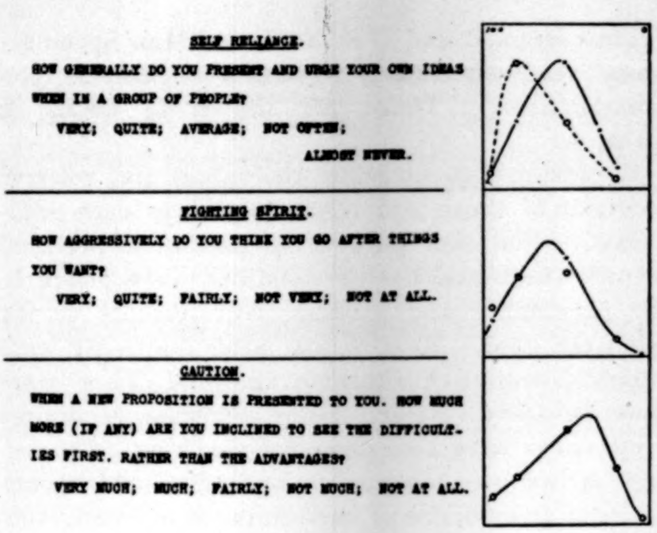
Figure 7 gives single illustrative examples from three categories. The curve for question (c) is probably correct but presents an interesting study.

In administering these questions to candidates the names of the basic characteristics are not given, but they are shown here for convenience in identification.

In the criteria on the questions we also have some evidence bearing on the correctness of our selection of unit characteristics or categories of behavior. If the units chosen were actually compound we should expect to have some difficulty in getting good distribution curves. This is evidenced by some of the individual questions which inadvertently introduce strong extraneous factors, as in Figure 5, question (c). In that case there are obviously likely to be two or more powerful variables and the resulting curve is in fact quite aimless and erratic. In Figure 4 the curves are all bad and indicate the probability that the category itself is not basic within our meaning.

Assuming that the categories are correctly chosen, and that the corresponding questions are reliable and valid and are intelligently and honestly answered by an individual, our measure of his average strength of response in each of these categories should not be far from the truth. We can now either use them as numerical values or draw a profile or graph of that part of the personality. The latter, however, facilitates synthesis for the prediction of compound behavior. Such a graph of average responses is shown at (a) in Figure 8. The findings of the personal interview are noted and compared. The general facts of the life history are considered. Additional factors, abilities and skills appropriate to the particular job are measured in any suitable way and added. This approximates our man, as is, and generally indicates also his probable direction of growth.

The next step is the job chart. As jobs and men must be compared in the same terms, the approximate "personality" of the job, if we may call it that, is also analyzed on the basis of the units already established. This may be the combined



SELF RELIANCE.

HOW GENERALLY DO YOU PRESENT AND URGE YOUR OWN IDEAS WHEN IN A GROUP OF PEOPLE?

VERY; QUITE; AVERAGE; NOT OFTEN; ALMOST NEVER.

FIGHTING SPIRIT.

HOW AGGRESSIVELY DO YOU THINK YOU GO AFTER THINGS YOU WANT?

VERY; QUITE; FAIRLY; NOT VERY; NOT AT ALL.

CAUTION.

WHEN A NEW PROPOSITION IS PRESENTED TO YOU. HOW MUCH MORE (IF ANY) ARE YOU INCLINED TO SEE THE DIFFICULTIES FIRST. RATHER THAN THE ADVANTAGES?

VERY MUCH; MUCH; FAIRLY; NOT MUCH; NOT AT ALL.

Figure 7

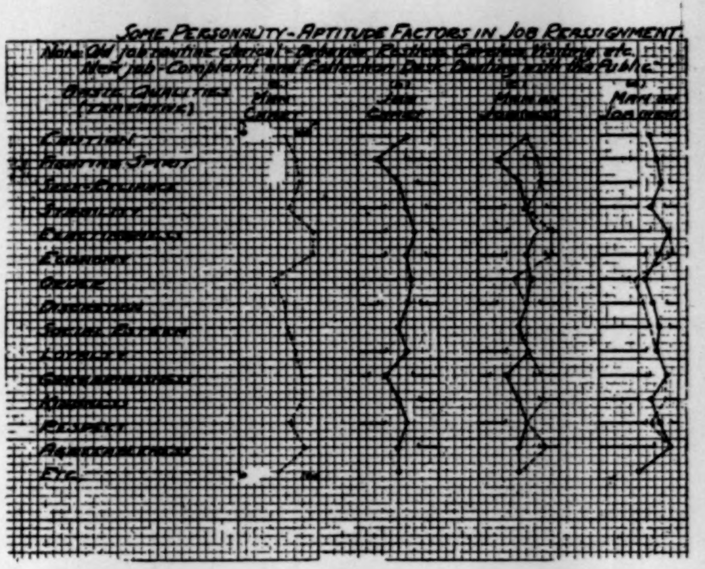


Figure 8

judgment of the supervisor and the personnel manager, and perhaps others, and is expressed in a graph similar to that made for an individual. The job chart has, however, one added feature. Upper and lower critical scores are estimated for each basic characteristic, and the dangerous areas indicated by heavy lines.

The personality section of a job chart is shown at (b) in Figure 8. By direct comparison now with the man chart, the degree of suitability of the man, and points of disability, become evident in appraisable detail. The individual's personality characteristics have become aptitudes for a specific job. Numerous cross influences and combinations have to be considered, as human nature is highly complex. But in the end we have some measure of the actual personal fitness of the man for the job and its environment. The good engineer knows all the properties of every part of his structure, before it is put to work. Eventually human engineers will be not less particular.

The remainder of Figure 8 indicates the application of this technique to a case of reassignment. Personality disabilities for one job which constitute fitness for the other are illustrated. Under (c) the man chart is superposed on the chart of the old job—a routine clerical job. It will be noted that in certain instances the man's graph runs beyond the critical scores indicated for various factors on the job chart. In this case restiveness and inattention, irritability, poor discipline and constant talking with fellow employes are induced by this situation. The personality is too highly geared and too sociable for routine clerical work. A successful job is indicated under (e)—complaint and collection desk, dealing with the public. Cases of improvement after reassignment are commonplaces in the experience of every personnel man. The present example suggests a method of analyzing the normal personality factors involved a little more definitely than usual, and making the reassignment on that basis.

An interesting case reported by Anderson[6] on the change of a girl from cashier to salesgirl is a good illustration, among many others, of the importance of considering also intellectual, physical and psychiatric factors. Time, however, permits only a mention in this paper of these and of specific abilities and skills.

For an illustration of procedure in original employment a rather elaborate case is taken, both because it is comprehensive and because it deals with our own subject, scientific management. This is the James Mapes Dodge Fellowship—two years of study and industrial experience leading to a career as teacher of scientific management. Illustrative portions of the technique are shown in Tables 1, 2, 3, 4 and 5.

The job specification is in the form of "do" things, as so ably propounded by Dr. Mann. From this are worked out the man specifications. For each major heading are listed not only the general

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[6] Anderson, V. V., "The Problem Employe," *Personnel Journal,* Vol. VII, No. 3, October 1928, p. 212.

TABLE 1

Job Description—Teacher of Scientific Management

(Preceded by two years of research and industrial experience)

General Statement—This vocation consists essentially in collegiate teaching of scientific management, using the principles of Taylor as a foundation, and applying these not only to industrial and business operations, but also to the problems of organization and of industrial relations, economics, costs and budgets, merchandising and the human adaptation of the man to his job.

General Objectives of the Job

1. Add to present knowledge and experience in scientific management through this two year fellowship
2. Teach scientific management in a school of collegiate grade as a career
3. Aim to develop students into teachers of scientific management or into demonstrators of scientific management in industry and business
4. Perform special activities indicated in job specifications

TABLE 2

Job Specifications (Condensed)

1. *General Qualifications* (Education, character, health, accept conditions)
2. *Teach—General* (Show proper aptitudes and abilities for teaching as a profession)
3. *Teach Scientific Management* (Acquire, organize and impart special information appropriate to this subject. To this end acquire especially experience and familiarity with actual industrial and business operations and practices with reference to: (1) Practical conditions to which scientific management may be applied; (2) Methods of applying it to these conditions; (3) Social and economic implications of scientific management practices.
4. *Inspire Students* with a desire to disseminate the information and its applications, and to create new values, as a contribution to the world's wealth, industrial progress, economic advancement and social welfare.
5. *Continue in Teaching of Scientific Management* as a permanent profession.
6. *Perform Additional Activities*:
    - (a) Grasp and solve actual industrial problems.
    - (b) Co-operate understandingly and successfully with industrial executives.
    - (c) Write in furtherance of scientific management principles and practices.
    - (d) Conduct continuing research in scientific management problems.
    - (e) Exercise leadership in the field of scientific management.

intellect, knowledge, skills and aptitudes required for the performance of these things, but also the personality, the desires and preferences which would tend to make the man do these things happily and with enthusiasm.

Thus items B and D in Table 3, "Man Specifications," refer particularly to Item 3 in Table 2, "Job Specifications." These are shown in detail in Table 4.

It remained to ascertain the actual and relative strength of these and other factors in each individual. For this purpose a combined personal history sheet and list of questions appropriate to the personality and aptitude requirements of the job were used. Most of the latter questions were supplied with five alternate answers. They were thus definitely ratable. Some alternate vocational preferences were also given for checking. The college record was accepted in lieu of an intelligence test and as evidence of various types of intellectual performance, but various specific intellectual responses were also checked by ratable questions similar to those for the personality.

The questionnaire is summarized in Table 5. Each kind of information sought is arranged under its appropriate heading, for convenience in evaluation, although some cross references were necessary. Ratable questions, in accordance with our present technique, are similarly placed under their appropriate headings. It will be observed that these were not used as a substitute for the more usual information sought on an application blank but were an entirely additional factor designed to increase the objectivity and scope of the data obtained. These ratable questions themselves will vary for different types of jobs. The aim is to make every item of data applicable as directly as possible to the actual performance requirements of the type of job in question.

The standard man analysis form was now keyed to the numbered items in the questionnaire, as shown in Table 4.

As the filled-in questionnaires were received from the applicants each item was rated and the score entered in the appropriate place or places on a tally sheet. Meanwhile a similar but shorter questionnaire had been sent to the references given, and these were also scored and entered. General personality was checked by a personal interview, but nothing was disclosed which tended to change the results. The items and groups were assigned weights and added up, and the final score was expressed in a single percentage. It is interesting to note that most of the applicants showed some particular disability—fell below the critical score

TABLE 3

MAN-SPECIFICATIONS (Headings only)

a. Desire to teach (in general)
b. Desire to teach scientific management (additional factors)
c. Can teach (in general)
d. Can teach scientific management (additional factors)
e. Wants to teach permanently
f. Can teach permanently
g. Can inspire students and others (additional factors)
h. Can grasp and solve actual industrial problems
i. Can deal with industrial executives
j. Can write
k. Can conduct research
l. Character
m. Health
n. General personality

TABLE 4

DETAIL OF MAN SPECIFICATION AND KEY TO QUESTIONNAIRE

A. *Desire to Teach* (in general)	
1. To Deal with Ideas	31G
2. To Deal with People	34G R
3. To Render Service	50, 58b, R
4. To Help the Young	42, 43, 55, R
B. *Desire to Teach Scientific Management* (additional factors)	
1. To Make Things Better or More Perfect	47a, 53, 32G, R
2. To Organize Concrete Things	29G, R
3. To Deal with Mechanical Matters	58G, R
4. To Foster Economy	28, 37, 38, R
5. To Observe System and Order	17, R
6. To Organize People	30G, R
7. To Deal with Sociological and Economic Aspects	12, 14, 62b

Note: Numbers in right hand column refer to questions and data. G denotes a group. R denotes that check information will be sought from references. RR indicates that references are a still more vital source of information.

TABLE 5

GENERAL HEADINGS OF QUESTIONNAIRE

Personal Data
(Name, address, marital status, economic status, etc.)

Education and Intellectual Characteristics
(Schooling, test ratings, scholastic honors, research and special work, work bearing on scientific management, specific interests in management and other subjects. Also ratable questions on specific intellectual aptitudes, with the five degrees of response indicated for checking.)

Extra-Curricular and Other Social Activities and Interests
(Co-operation and leadership in grammar school, high school and college; organization memberships; offices and honors; associates; leisure relaxations and amusements. Also ratable questions on sociability.)

Teaching Experience and Interests
(Subjects, and time taught; relation to scientific management; particular interests in teaching; most successful subjects.)

Other Personal Interests and Activities
(Ratable questions on additional factors of present importance, indicated in the man analysis.)

Other Vocational Experiences and Interests
Jobs held; details; preferences for particular factors; avocational activities; writing; ratable questions on mechanical interests and aptitudes; selling experiences; present and past vocational preferences; ratable choice of alternative vocational situations.)

Request for Own Personality Sketch and Names of References

in one or more respects without sufficient compensating circumstances—and the final tabulation did not have to be carried out in their cases.

Reviewing the present applications of the technique, it appears that the original analysis of jobs can be made more completely and in more accurate detail, with respect to the personal requirements in an applicant. The application blank, or blanks, while longer yield more definitely appraisable information in this respect. The same may be said for the reference questionnaire. With the man-job analysis before him, the interviewer is also afforded an additional technique, directly purposive in its methods and organizable in its results. The methods used in employment can also be profitably applied to cases of reassignment or promotion. In post-employment procedures, a number of future applications appears logical. Through a better understanding of the individual, light should be thrown on such matters as training, methods of supervision, and incentives.

I have long held the view that failure or success in the employe was more often a matter of personal adjustment to the job than of lack of technical skill; that is, if a man were hired at all he generally had evidenced sufficient intelligence and skill to enable him to carry on the operations. Subsequent failures on the job seemed to be due largely to factors within his own personality. This was interestingly corroborated by a symposium of twenty-seven major executives and responsible personnel officers on the principal causes of failure as they had observed them. Out of twenty principal causes most generally agreed upon, seventeen were personal to the employe and only three had to do with intelligence, knowledge or skill.

Some of these personal failures arise from lack of capacity for adjustment to the environment, quite as much as to the work itself. This phase should be given careful consideration in both the interview and the analysis of the personal record. Even a stenographer is a better employe if in an environment and business which is appropriate and interesting to her personality.

While this paper is essentially on the subject of the appraisal of personality, and the aptitudes arising from its various manifestations, it may be mentioned in passing that there is evidence that the same technique will be found useful in indicating intellectual and special aptitudes and interests, where other definite measures are not available.

You, in developing this instrument for your own purposes, may need to make adaptations. However, if your experimental work is controlled as far as possible and is evaluated by proper statistical procedure, the result should be a technique of very definite usefulness.

When by all possible means we have once found out how better to appraise men for jobs with respect not only to their intelligence, knowledge and skills, but also to their actual ambitions and motives, their proclivities and talents, their opportunity for the maximum self-realization, we shall at the same time affect quality and quantity of output, satisfaction on the job, and profits for employers.

In conclusion, our present technique is an attempt at a more exact fact-finding and fact-organizing procedure in one field of personnel work—that pertaining to personality and the aptitudes arising from it. A technique of this character is, of course, more laborious than the usual methods. If it is also more accurate, it is worth the effort many times over. The most expensive and troublesome wastes in business and industry today are those of man-power. We must have better human engineering.

Discussion

Frederick G. Atkinson.[7] The technique Mr. Hull has presented contains an idea which eventually may be of great value in the process of selection for subexecutive positions, and perhaps for other groups of positions. It holds even greater promise, I believe, for the solution of vocational maladjustments growing out of personality difficulties. For the moment, however, there appear to me to be three major difficulties in Mr. Hull's technique.

My first question concerns the proposed tentative list of unit personality qualities. Mr. Hull forestalls criticism by the modesty of his claims and by the readiness with which he acknowledges the possibility of improvement in terminology, but I am inclined to be pessimistic about the practicability of any such list. Mr. Hull recognizes the vagaries of these terms, and has supplied adjectives and synonyms in an effort to restrict their interpretation and use. Nevertheless, personal and individual reaction determines the definition of such terms as "fighting spirit," "self-reliance," "loyalty." While we each of us feel reasonably confident that we know what "agreeableness" is, or "gregariousness," I venture to say that if each member of the group here present were to define independently any one of Mr. Hull's unit terms, we should have almost as many different definitions as we have individuals in the group.

Psychologists have long recognized that these personality traits do not exist as faculties or entities. The extent to which an individual displays fighting spirit or orderliness varies according to the situations in which he is placed. For example, orderliness in one's personal appearance is no reliable promise of orderliness in one's writing desk.

Of course, if a list can be constructed and coupled with a method that makes its use profitable, we shall not quarrel with nuances or subtle implications of expression. Mr. Hull's list, however, is necessarily purely arbitrary, and must bring with it adequate experimental evidence of its practicability before we can feel safe in leaning very heavily upon it.

The second difficulty of the technique as outlined lies, I believe, in the means whereby Mr. Hull proposes to measure his subject in terms of the "unit qualities" he has set up. Experimental evidence, notably Hollingsworth's, indicates that, while human judgment of others is highly fallible, self-appraisal is still less reliable. And self-rating in personality traits, our terminology being as ambiguous as it is, appears to be even more dubious. Add the applicant-employer relationship wherein the job-seeker is naturally alert to any device which he feels may put him in a more favorable light and the likelihood of valid results is reduced still further.

Mr. Hull observes that psychologists have been earnestly attacking the problem of measurement of personality traits. Reliability of results has been, as he points out, rather low. One study, recently completed, has particular bearing on the technique we are considering. Hartshorn and May, working at Teachers College of Columbia University under a three year endowment, have been endeavoring to establish a satisfactory technique for measuring one personality trait, "honesty." Their findings have been published under the title "Measurement of Deceit." I shall not go into detail concerning their studies, but should like to mention three facts which seem to bear directly on the present study. First, these two trained psychologists required three years to develop a technique for measuring just one personality trait; second, in the light of their experience, there appears to be no basis for assuming that valid measurements for other personality traits may be established by any process less patient and exacting; and third, during the administration of the tests which they devised, the subject was not permitted to know what qualities were being measured.

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[7] Supervisor Men's Employment, Personnel Department, Henry L. Doherty & Company, New York.

The third difficulty to which I would point in the technique as outlined lies in the basis for establishing the psychograph of the job, or job chart. According to Mr. Hull's plan, the line officers involved, in conference with the personnel department, reach some agreement as to the amounts of various personality qualities a given job requires. The larger the group, of course, the more difficult it would be to reach any unanimous agreement. Since our terminology is loose and opinions on these matters divergent, I am afraid that we should not only find general concurrence on any point rare but any results achieved would be of extremely doubtful scientific value. Perhaps it might be possible to establish the job chart by approaching the problem from another direction, that is, through analysis of the personality characteristics of a sufficient number of individuals whose performance on the job in question was successful according to standards, or norms, which would have to be worked out. Such a plan presupposes, of course, the development of a satisfactory technique for measuring these personality traits.

W. V. Bingham.[8] The problem of personnel selection is difficult because the factors which must enter into a decision are so varied. In employment practice no less than in vocational counselling, one would like always to appraise correctly and give due weight to a person's general ability, special talent, dominant interests, physique and health, educational accomplishment, social effectiveness, and emotional balance, in relation to the opportunities and demands of the callings under consideration.

Mr. Hull is to be cordially commended for his courage and persistence in attacking one phase of this problem, that of personality traits in relation to occupational fitness. This is no easy task. Human traits are less tangible and more variable than the materials and forces which the engineer ordinarily has to measure. Yet their correct appraisal and control are no less vital to the success of engineering enterprises than is the reliable measurement of physical stresses.

Mr. Hull has not been content to leave the determination of these human traits entirely in the vague realm of impression, intuition or guess. He has sought to make use of the engineer's basic concepts: units and measurement.

As I understand Mr. Hull's argument, he holds that such traits or qualities as caution, aggressiveness, self-reliance, stability and order may be treated as unit qualities because they have, as a matter of fact, each maintained a certain consistency during the course of his analysis of employes and applicants; whereas initiative, accuracy, courtesy and the like are compound qualities because they have proved in practice to be readily reducible to these simpler units. I should like to see the analysis carried even further by use of the same techniques of specific questions and methods of evaluation which he has found helpful. Perhaps his unit qualities can be still further broken up, as the atom has been resolved by chemistry. Such, at least, is the first question which occurs to me, in looking over his list of unit qualities. Mr. Hull's reply may very properly be that he is not now seeking ultimate unanalyzable units, but is rather aiming to locate and define qualities which may profitably be thought of as unit traits of personality and aptitude during the course of an employment interview. He is not undertaking to solve all at once the mysteries of employment psychology. He is taking a next step in the direction of a clearer understanding of some of the many factors which ought to enter into the interviewer's appraisal.

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[8] Director, Personnel Research Federation, New York.

Samuel S. Board.[9] May I say before proceeding to a more detailed discussion that I agree fully with the speakers who have discussed the paper before me. I shall, in fact, merely amplify from our experience some of the points already made.

Mr. Hull's paper undoubtedly shows a great many hours of labor and a careful attention to the working out of the elaborate machinery involved but I cannot help but feel some doubt as to the underlying basis on which it is established. I had the privilege of sitting in, a year and a half ago, upon a conference of distinguished educators and students of this problem, where rating scales were discussed as part of the agenda. After thorough discussion a subcommittee appointed for the purpose reported that the rating sheets so far in use seemed of very questionable value, and the others agreed. Because this has been so popular a tool, however, they undertook to lay down some of the principles involved and to devise a tentative one which might be tried out. I understand that this is now available.

Our own experience in the Yale Graduate Placement Bureau would confirm this. We have tried to use two. One was devised for use in a reference blank to employers in order to check their observations of a man on the job. We have found this fairly successful, but it is far from an objective measure of a man's success. We have three questions as cross-checks in the blank which enable us to detect obvious bias on the part of the man making the rating. The other rating sheet was one devised to register the first impression of the interviewer when an applicant came for a job. We took pains to include only those items which might be gauged by observation. Frankly we found this so difficult to do at all that we have abandoned it and are now looking for some better means of doing the same thing.

The most serious objection, however, seems to me to be the fact that the man must rate himself, even if it is in answer to a series of questions. A very interesting paper given recently at the Conference of the Personnel Research Federation discussed at length the variability of men's emotions over a period of time and produced some evidence, which looked interesting at least, to show that this was of a periodic nature. I think most placement officers will agree also that just the being out of a job not only upsets a man's emotional stability but seriously interferes with his judgment, especially as it refers to himself. We have one man, for instance, who, when he is out of work with nothing in sight, expresses willingness to consider $5000 or even $3000 but as soon as there appears to be a job in the offing his price goes up to $7500. This is simply a numerical index of his rating of himself, which really varies just about as radically. Again I have had the experience of having a man rate himself verbally very low on the scale of successful human relationships because of some bad break, only to have his confidence rebound as soon as he has been able to rationalize the situation in his own mind. One would question, therefore, whether the profile of a man's rating might not differ radically under varying circumstances.

One of the things I learned in college from a very famous professor of mathematics has stayed with me ever since, even though the course itself has been largely forgotten. He insisted, and repeated again and again, that the larger the number of variables in a given equation the larger the chance of error, and that no equation was any more accurate than any of its variables, even though it might be worked out carefully. No one would welcome with more enthusiasm a tool such as Mr. Hull has devised if it could be validated, but there are so many elements subject to fluctuation that validation would seem to be almost an impossibility.

C. R. Dooley.[10] Mr. Hull's suggestions appear to me very complex and therefore difficult of appreciation because of lack of time. And to make the best use of his technique an expert, possessed by few employment offices, would be required.

After going to a great deal of trouble to measure accurately a list of characteristics it sometimes happens that a man fails on some point that has been quite overlooked. It is, of course, impossible to measure every possible characteristic. For example, domestic and social relations may be rather difficult to check on, and may even be entirely overlooked. Yet in the end they may cause a great deal of trouble.

It frequently happens that an organization is prevented from making transfers even when the facts are known concerning an individual's characteristics. That is, it may be impossible to take a man from one position where he is not altogether efficient and place him in another for which he is apparently better suited, because it would interfere with tradition and general matters of morale in the group to such an extent that the result as a whole would be worse than in the first place. I mean by this that such moves cannot be based entirely upon the man himself but must be based upon the whole situation.

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[9] Director, Yale Graduate Placement Bureau, New York.

[10] Manager, Personnel and Training, Standard Oil Company of New Jersey, New York.

I think it possible that Mr. Hull's plan might prove helpful in the selection and training of junior help and those engaged in routine work. His questions to be used at the time of the interview are very stimulating and should be suggestive to any employment man who is trying to build up a set of questions tending to make the interview more efficient.

Mr. Hull has shown that he realizes that his suggestion cannot completely take the place of other factors in the interview. It should be used as one factor and for just what it is worth. I for one feel that some such suggestion as Mr. Hull has made is valuable.

We have discussed a great many personal qualities which might be measured with profit. Conduct and adjustment to situations are very complex matters, however, and I do not believe that they can be predicted entirely from the abstract qualities of the individual alone. A man reacts not only according to his own qualities but according to the environment in which he is placed. Conduct is really a reaction. While there may be considerable value to be gained from discussing many qualities and their proper measurement, from a very practical point of view I think there are only a few fundamental qualities which it is absolutely essential to consider. The first is absolute integrity or honesty, or whatever other name you may give to that quality which makes a man stick to the thing he knows is right at any cost. It may be called loyalty, but often it is the higher loyalty to a cause rather than an individual. Second is ability, sheer brain power and common sense. Of course it is necessary to determine just what kind of ability each man has, and yet there is such a thing as general good sense and ability. I am not talking about genius or anything phenomenal, but about a good level head full of ordinary brains. The third quality is ability to get along with associates. This consists of ability to fit in pleasantly, to co-operate, to keep one's temper, not to bore the life out of one's associates, and so on.

To these three characteristics, there might be added purposefulness, ambition, energy, industry, and other things which help to determine just what kind of work a man should take up. On the whole, however, I believe that the three qualities given above are so fundamental that, if they are satisfactory, the others can either be developed or their lack put up with. Many a man because of his ability and honesty is so effective as a salesman that you put up with his peculiarities and count him a good man. Given men who are honest, who have ability and who can somehow fit in with their associates, the problem of the manager is not to hire and fire men but so to adjust them that their efforts will complement each other. Shortcomings will be compensated for and an efficient organization produced.

R. H. Fogler.[11] I am glad indeed to be one of those chosen to discuss Mr. Hull's paper, for it gives me opportunity to pay tribute to the care and thoroughness of its preparation and the clear and interesting manner of its presentation. It is surely a helpful and very worthwhile contribution in the field of scientific management.

My comments will be limited largely to a consideration of just one of Mr. Hull's statements. It reads as follows: "The laborer probably cannot answer the questions and the candidate for president will not." This refers to the questionnaire which Mr. Hull has suggested for use in selecting subexecutives. The first clause is, I think, a direct challenge to those of us who were formerly laborers and the second an equally direct challenge to any among you who may be presidents or aspiring to be.

Well do I recognize the lack of native ability of many individuals, but I believe it is a mistake and contrary to the principles of good management to infer that some of the individuals in any group, whether laborers, salesmen, clerks, or office boys, cannot do a particular job just because it happens to be different, and possibly more difficult, than those which are being done. Surely there will be large numbers of individuals who cannot, but just as surely there will be others who can. The proof of this is to be found in the careers of hundreds and thousands of individuals, now holding positions of leadership in all walks of life, who were at one time working in the humblest of jobs.

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[11] Director of Personnel, W. T. Grant Company, New York.

I believe that a questionnaire and a technique such as that suggested by Mr. Hull will frequently produce better results in locating subexecutive, or even executive, material when used within the organization than when used in interviewing applicants from outside. If this is not true a complete overhauling is needed either of the questionnaire or of the employment department.

Might it not be advisable to allow those candidates for the president's position who will not answer the questionnaire to continue as candidates? Certainly no organization would consider the buying of materials or the purchase of property if the owner or agent advised that it was too good a value to be investigated. Why then should an organization consider the employment of a president who in his own estimation is too great a value to be investigated or, as it is usually put, is "too big" to adjust himself to the rules of the game? I wonder if such people are not frequently in reality too little.

Probably it is too much to expect that all presidents will possess the qualities of true simplicity and humility characteristic of real greatness, but certainly it is not too much to expect that every personnel department be working toward the application of scientific principles in the selecting of presidents as well as in the selecting of clerks.

The question has been raised as to whether or not Mr. Hull's technique is good, or whether it is practical. May it not be possible that it is much more important to consider whether or not a careful technique is preferable to no technique at all? I doubt if Mr. Hull would recommend that those of us who are faced with the problems connected with daily placements and promotions use for all cases the specific technique which he has worked out, or a similar one. There are too many factors to be given consideration, one of the most important of which is that of time.

Just recently in our own company we had the problem of filling one of the most important positions in the organization. As I believe is usual, everyone was much concerned, but hardly any two people were in agreement as to the best method of approach in getting the right man for the job. The income was adequate to command the services of the majority of the outstanding men in that particular type of work, irrespective of their present connections. Progress was almost nil, however, until we developed a technique, which consisted simply in rating available men both within and outside the organization one against another in terms generally in use and understood by the company executives. These terms were by no means units, as defined by Mr. Hull. In fact, most of them were not even simple compounds. The terms were as follows and were grouped as indicated:

Group I. General qualifications of importance when considering individual for any major position

Business personality
Character
Education (in school and since)
Native intelligence
Physical strength (health)
The will and the willingness to work
Ambition combined with vision
Thoroughness
Aggressiveness
Leadership capacity
Executive ability
Ability to get things done
Imagination
Creative ability
Business judgment

Group II. General qualifications particularly important for persons in positions where co-ordination with others is essential

Pliability
Dependability
Disposition
Unselfishness
Tact

Group III. Technical qualifications particularly important from the standpoint of the specific position to be filled

Sales promotion ability
Display ability
Advertising ability
Knowledge of merchandise
Knowledge of company, its methods, policies, and personnel

In our consideration we gave greater weight to some of the factors than to others. For instance, we rated character as of greater importance than business personality, and dependability as of greater importance than tact.

Just a glance at the above list will indicate that one factor is dependent upon another, or possibly upon several others, and that definitions are lacking. To me, the important thing, however, is that this procedure helped us to reach a decision based on a rather careful study of the available candidates. As a result we promoted one of our own men and he is doing an excellent job.

I feel sure that some such technique as Mr. Hull's should be of great assistance in placement and promotion.

Closure

IT IS pleasant to note that in the discussion of this paper there is no doubt raised by these very practical gentlemen as to the entire desirability of having more scientific methods for appraising personality. Neither is there any serious question of the propriety of the general method of approach to this problem. The principal questions raised concern difficulties of practical application.

With this questioning the speaker is in entire accord. After a principle itself is established, it often requires years of study and experimentation to perfect adequate methods of applying it to all appropriate situations. In developing these methods, discussion is of the highest value. The able and thoughtful comments on this paper cannot but illuminate the course of future progress.

There were however certain points raised which may permit of further brief comment at this time.

One of these was whether the personal questionnaire does not suffer seriously from the disabilities of the usual self-rating scale. An examination of the questions shows that the personality questionnaire is not a self-rating scale in the usual sense. The applicant is not asked to rate himself on a trait or quality as such, nor is he given the name of the quality in question. He is merely asked to tell his usual degree of response to a typical situation, stated or implied. Statistical analysis of the results gives considerable evidence that this can be done quite accurately. This is not the case with self-rating on "traits."

A further evidence of the improved results from this form of question is furnished by a comparison of the replies by references to similar situational questions. In the case of the Dodge Fellowship, for example, using situations as criteria, the ratings of the references were practically unanimous on some points and varied comparatively little on most others. Part of this improvement is doubtless due to the more objective nature of the questions and part to the diminution of the "halo" effect often found in rating a series of general traits.

Still another reason for the increased accuracy of the present technique is probably the fact that the situation responses pertain to unit qualities only. This avoids the confusion arising in an attempt to rate a compound characteristic. It has already been shown that where two or more basic impulses are joined, erratic and uncertain ratings are produced. The two investigators who spent three years trying to measure honesty were trying to rate one of the highest factored compounds known.

Another question was whether there are any such things as traits at all. The squabbles of the psychologists on this point seem to be of little practical interest to us in the present discussion. Every employment man tries to appraise in an applicant certain points of individual difference residing in the personality and abilities of the man. Whether he calls them traits or not makes no material difference. He knows that a certain job requires a man who is characteristically self-reliant, for example, and looks for evidences of this quality.

It is true that a man's responses will vary in strength with different situations, due to the presence of other influences and other degrees of stimulation. But the employer knows also that a given job-situation will evoke quite a different response from the self-reliant man and one who is not, if the job calls for this quality. He therefore chooses the man, other things being equal, whose normal behavior best fits his job-situation in this respect.

The difficulty suggested in getting foremen and others to understand the meaning of the unit characteristics disappears largely when these are presented as types of behavior. Experience shows that department heads readily grasp the appropriate expressions in the operations of their own departments, and not only offer intelligent and logical percentage ratings on basic qualities in man- and job-analysis, but eagerly reach for the pencil to enter the ratings themselves.

When confronted with a compound characteristic, however, they are more hesitant. The word carries too many diverse connotations in terms of job-behavior. This is one of many evidences that work with basic terms is easier and more accurate.

In conclusion, the essential proposal of this paper is to reduce human nature to its simplest and most measurable terms; and to treat jobs not only as aggregations of performances but also as differentiated forms of normal human behavior.

Cost Finding for an Electric Utility[1]

A Case of Precise Cost Finding in a Most Difficult Industry

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A system for determining accurate costs is one of the outstanding tools of management. As the underlying principles of good cost accounting are pretty much the same irrespective of the product being manufactured, the story of the development of a clear cut case of exceptional cost finding technique, in perhaps the most difficult industry in which such accounting has been used, must have a wide interest.

I. Introduction

THE DATA used in the setting of electric rates have always been somewhat of a mystery, both to the user of light and power and to the public service commissions charged with the regulation of electric service companies. The formulae used for computing the monthly charge for electric service can readily be understood, the results obtained by the use of the formulae can be easily checked, but the figures used for creating the formulae have seldom, if ever, been furnished to the consumer or to the utility commissions.

The public service commissions who guarantee an adequate return on capital investment in the utilities which they regulate should insist that the public is entitled to know the detail as to charges rendered to it for service. When power and light rates are based so as to yield a fixed return upon either actual capital investment or upon the replacement value of the plant, both the value of the investment and the operating charges pertaining thereto and applicable to each class of service rendered, should be given. This procedure would help to clear away the cloud of suspicion that now exists regarding the fairness of rates.

Fixed return, however, means far more than a fixed return upon investment or replacement value. The basis of fixed return is arrived at after operating and maintenance expenses have been deducted. Therein lies the joker that not only protects the utility against inefficient management but also should make certain a fixed profit on all classes of service. Under the present type of cost accounting a power and light company can render certain classes of service at a loss and have this loss made up by an excessive charge to other classes.

A buyer is entitled to know the basis of the payments exacted from him. Therefore, a public service commission acting as the neutral body, between the utility and the public, should, in all justice to the public, insist not only that the invested capital be allocated to class of service, but also that the same be done with the operating and maintenance charges. Until this is done the public, especially the small consumers who cannot employ an engineer to analyze their bills, will continue to look with suspicion not only upon the utility but also upon the commission.

With the limited information available on the actual cost of power and light service, a rate case presents a difficult problem to a utility commission. Without the proper information on actual costs, rate problems cannot be fairly decided by any commission, regardless of its desire to be fair to both sides involved in a rate controversy. Without actual service costs available, precedent and certain established rules must be followed in arriving at a decision.

Under the present methods used for utility cost keeping, the utility has a distinct advantage in a rate hearing. It knows that while the figures it presents on service costs cannot be proven by its cost records, it is safe in presenting them, because the figures cannot be disputed by either the customer or the commission, due to the limited knowledge possessed as to actual service costs.

It should not be inferred from this that utilities consistently use operating figures to suit the convenience of each rate hearing. Power and light companies, efficient though they may be from a technical and operating standpoint, as a rule cannot give the actual cost of serving each of the several classes of customers. This situation is due to their persistency in following a system of cost accounting that shows the total cost for all customers and not that of each class of service rendered. Were the utility companies forced to justify each individual rate at one time, instead of the particular rates associated with the individual cases that happen to be brought before a commission, the current type of cost keeping would quickly be discarded.

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[1] Paper presented at a meeting of the Taylor Society, New York, December 6, 1928.

The correct charge for service rendered should be based upon a classification of accounts that will permit a comparison of revenue to operating and investment charges for each class of service furnished by the utility. Each community should be considered as a separate unit of revenue and expense, even though certain costs are incurred for two or more communities or for the property as a whole. These joint costs can readily be allocated to the individual community and class of customer by a fixed predetermined proration.

When considering the limited amount of actual cost data presented by either side in a rate controversy, one may be well justified in asking the question: "What is it all about?" The question would be a fair one. The customer cannot present figures to prove his claim, and the evidence offered by the utility is as a rule simply a brief prepared for the particular case. The brief is seldom, if ever, supported by a complete statement that will show the revenue and expense for each individual class of customer served.

The utilities are clearly within their rights in using the type of accounting, based upon the classification of accounts prescribed by the various state commissions, which shows expense only by departmental classification. If the commissions would go a step further and direct the utilities to follow the prescribed classifications in a manner to permit the segregation of costs to class of service, the information thus obtained would be of great assistance to any commission seeking to arrive at a just decision on an intricate rate problem.

In justice to the utilities it should be understood that they follow the classification of accounts as required by the various state commissions. Should an individual utility desire to use actual costs of service to assist it in setting fair and equitable rates, it should have a reasonable guarantee that all discrepancies discovered in its existing rates would be adjusted in a manner that would not be embarrassing to the financial status of the utility.

The part played by power rates on rate making, and their effect upon the question of basing rates upon costs of service, need to be considered. In the first place, there is doubt in the minds of those familiar with power rates whether, generally speaking, a proper return is secured from large power users served by central stations. Although utilities of today are protected from competition of similar utilities, there still remains, however, the competition of the private plants of large power users who can generate their own current at a comparatively low cost and consequently often get preferential contracts for power. Such rates are open to the public but are only advantageous to the large users.

It is argued, erroneously I think, by utilities that, although an adequate return from a direct earning standpoint may not be secured from large power customers, that class of business is a great help in keeping the load factor on a straight line, and, at the same time, such business absorbs a considerable portion of the general overhead as well as operating and investment charges.

The rates charged large power users exert a considerable influence on the question of basing rates on cost of service. It is feared by utilities that if actual costs were known, regulating bodies would force up rates on large power users and thus cause the utility to lose a portion of its business.

But let us consider the argument. During the process of building up a uniform load, almost every light and power company entered into certain power contracts that were not profitable to them. The time has gone by when any operating company has anything to gain by retaining an unprofitable customer. It would seem that the most practical thing to do would be to analyze the cost of each class of service rendered and revamp the rates to suit present conditions. The mere fact that there is considerable doubt as to an adequate return being secured from the large power users should act as a spur to the utility to secure correct costs for every service rendered. Any deviation from an adequate return from each class of service rendered should be made only when such deviations serve as a distinct benefit to all classes of customers or to the community as a whole.

If state-wide systems, with their large generating stations and their central control of operating and financial conditions, cannot compete with privately owned plants, there must be certain extraordinary conditions involved which would suggest that these private plants should be permitted to operate for themselves. It is not fair to have other customers assume the losses incurred by serving these special customers from the central station.

The conditions revealed by real cost accounting will have to be fairly dealt with by the regulating bodies if the latter wish to encourage the utilities to analyze actual returns on the various classes of service rendered. Should assurance be given to the utilities that the conditions arising from a change in cost accounting methods would be settled in a manner that would not bring chaos into the public utility field before these conditions could be rectified, there is little doubt that many of the progressive utilities would co-operate with the commissions in an earnest effort to secure costs that would be of a real assistance in arriving at fair rates for every class of service rendered.

The foregoing paragraphs are not written with the thought that any general theory or practice of cost accounting will serve as a panacea for all rate problems. These will be with us as long as there is a customer buying from a central station.

In this period of the consolidation of individual utility companies into groups and these groups into large holding companies comprising power and light, gas, street railways, water, and bus companies, there is a lack of the old fashioned utility economy of operation that was formerly considered necessary to permit the operation of a utility without loss. This lack of operating economy is due to three outstanding conditions.

First, the higher executives cannot, under present methods of cost accounting, accurately check the economy of operation of each individual property. Knowledge of local conditions of each property is at the best rather meager. Long distance managership cannot be expected to compare favorably with the type of supervision given on individual property by those who know every detail of local conditions. Granting that, through consolidation, the smaller properties secure the services of a higher class of engineering and financial talent and lower generating costs, both through the interchange of current and the use of larger power stations, the fact remains that rarely, if ever, have rates been reduced to the public through any consolidation of properties. The reason for this condition can frankly be stated as a lack of accurate and comparative knowledge of costs.

Secondly, as long as the price of labor and material going into the capital accounts was increasing each year, and as long as utility commissions permitted the earnings allowed to be based on replacement value, the lack of operating and construction economy could be ignored. With the cost of construction work slowly but surely receding to a lower level, however, the utilities must eventually be placed in a position where they face a demand from the public for a new deal on service rates. With the utility commissions acting on the theory that adequate returns must be based upon replacement values, with construction costs on a level that will not permit former construction values to be appraised at a higher level, it is apparent that the utilities are in a serious situation as far as securing increased rates to cover lack of operation economy.

Thirdly, returns on investments are based on earnings as a whole, not on individual classes of service. This permits the pouring of all departmental costs through the proverbial funnel, thus eliminating all chance of lowering costs on the classes of service which may show upon proper analysis that they are unprofitable.

It is quite evident that many of the holding companies have already seen the handwriting on the wall. They realize that adequate returns can no longer be secured through increased valuation. This is proved by the pressure that is being put upon the local and district managers in an effort to decrease operating costs. With the maximum replacement value allowed, adequate returns for the future must be based upon operating economies.

With the changed conditions confronting the utility operators, it is apparent that the present wholesale hiding of cost of service must change and that future returns must to a great extent be based upon the earnings from each class of service rendered. This means that rates in the future must be set and defended on the basis of cost of service rendered, and that cost of operation must be broken up to permit comparison of the cost of service and the revenue derived from such service. From the foregoing it will be seen that this paper has at this time a special interest for investors in our electric utilities. Other things being equal, that company which adopts cost finding that permits comparison of revenues from a given class of service with the expense of rendering such service will be in a stronger position than those companies depending on a comparison of total revenue with total expense—at present the general rule used in regulation.

The purpose of this paper, then, is to urge the necessity of securing actual cost data for both operating and rate purposes and, as a contribution to this end, to present the cost accounting methods used by one light and power company for the allocation of operating and maintenance costs to classes of customers. The fact that this utility prospered by following a policy of securing actual costs of service, and using this information as a guide in operating the property and in setting rates, would indicate that the methods used may be of interest and help to other utilities.

II. The Cost System

Before going into the cost methods used, it may be well to consider the physical layout of this utility. By identifying the location of the various communities served and the power plants and transmission lines used for supplying the current, the subdivision of the classification of expense and revenue can be readily understood. Operating in four counties (see map, Figure 1, page 90), which for a better terminology were called districts, these counties were further divided into communities, called divisions. Each division was a subdivision of a district, and as such retained its identity in the classification.

Thus, each division represented a particular town or city in a district; the scattered customers, mainly made up of power customers who were not located in a town or city, were combined under a separate division in each district.

There was one general operating office in each of the four districts, supplemented by additional commercial offices in the various cities served, the number of these offices depending upon the size of the communities in the district. The property as a whole was directed by a general office which, through its various departments, supervised the work pertaining to the general activities of the utility. The current was generated by two active power plants and three standby plants. The active plants are indicated on the map as CPA and CPB, and the standby plants as CPC, CPD and CPE. The standby plants were used only when trouble occurred in the active plants or on the transmission lines. A small amount of current was purchased from an independent water power company. This current and its cost are included with that of the standby plant CPE, both plants being located in the same community or district.

The cities and towns served had populations of from three hundred to eighty thousand. Several hundred miles of high tension transmission lines were required. Both overhead and underground distribution lines were required in the larger cities, and many of the larger customers required their own transmission lines and substations. From this description of the physical layout of this utility it will be seen that almost every conceivable operating condition confronting a power and light company existed on this property.

Classification

The classification of accounts used by this utility was based primarily upon the classification adopted by the National Electric Light Association and quite generally prescribed by the regulating commissions. This standard classification was simplified to permit the allocation of joint costs and the segregation on individual city and customer costs. By adhering to the classification of the N. E. L. A., a direct comparison with "costs" of other utilities using this classification could be made.

In tying in the cost accounting with the general accounting, care had to be taken to be sure that everyone connected with the handling of costs would have the same general understanding of the division of the general ledger accounts. For the purpose of instructing the employes in selecting the proper general ledger account to be used for any cost incurred or any revenue received, a key[2]

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[2] Mnemonic symbols were used throughout. These symbols were arranged so that this type of classification could be used in connection with standard tabulating machines. At the time the installation was made, it was felt that mnemonic symbols had a distinct advantage over numerical symbols because they were more easily interpreted and remembered.

With the more recent improvements made in modern tabulating machines, it is a question as to which type of symbol is the most advantageous. By using numerical symbols, both the symbol and the tabulated costs can now be printed automatically by the tabulating machine. However, the type of symbol used has no necessary bearing upon or relation to the methods used for allocating or accumulating costs.

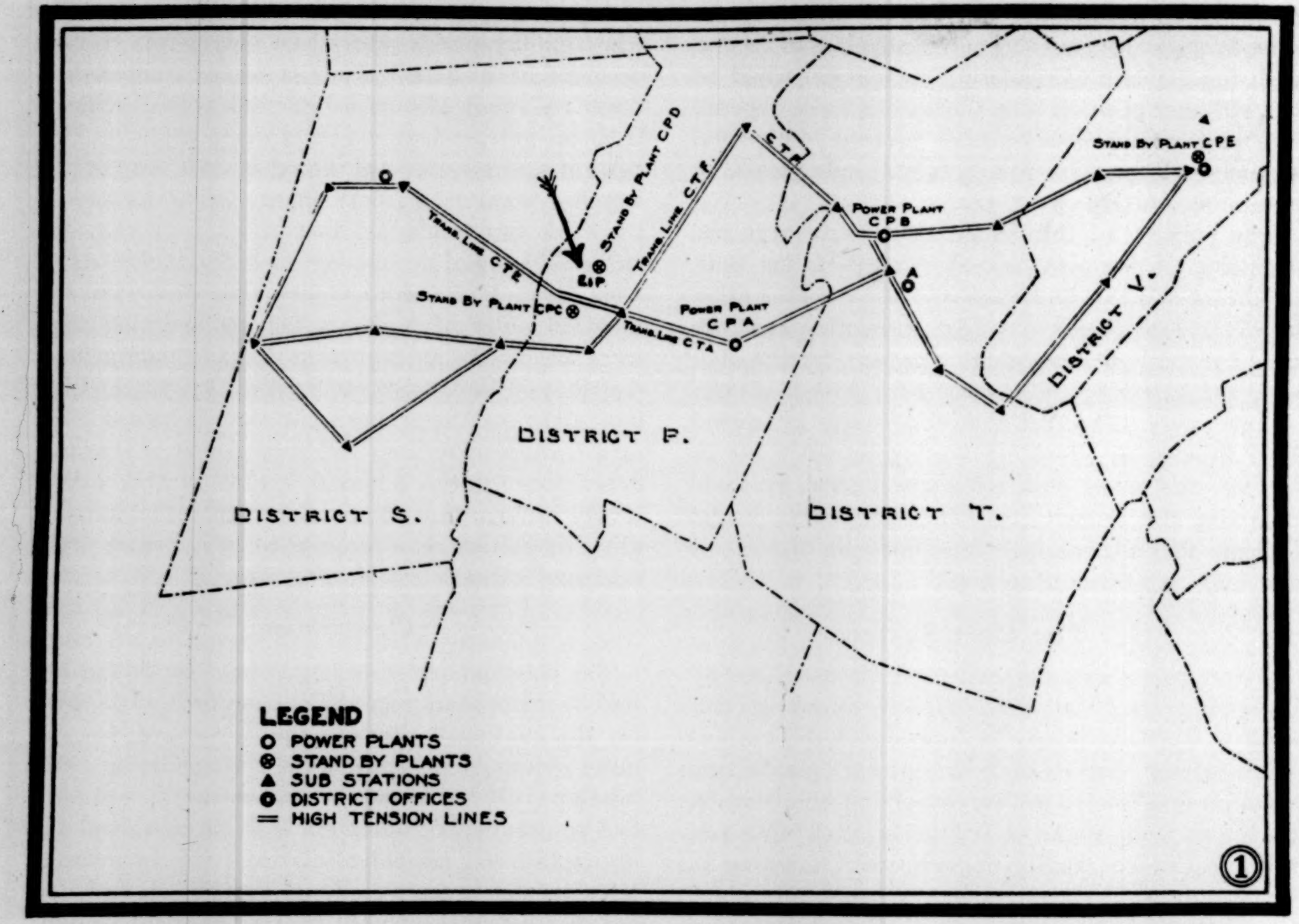


Figure 1

for the first character in the symbol was prepared (see chart, Figure 2, page 91). It was found that by following the instructions as shown by the three questions asked on the chart, little or no difficulty was encountered by those using the classification.

In this paper only two general ledger accounts need to be considered: first, "C," representing Electric Operating and Maintenance Expense, that is, departmental costs; and, second, "E," representing Electric Customers' Expense, that is cost of each class of service rendered. The charges accumulated under "C" are either transferred or prorated to "E." The costs incurred under the other general ledger accounts have no bearing on operating and maintenance costs applicable to electric customers' expense. Physical assets were distributed to classes of customers as the expense was incurred and, therefore, remained a fixed cost, just as fixed costs are incurred and treated in an industrial plant.

Electric operating expenses, represented by the letter "C" on the base sheet of the Classification of Charges (see Figure 2, page 91), were subdivided as follows:

CB *General expense.* Cost of conducting the general offices of the entire property. Also cost of time keeping and planning departments, laboratory and testing departments, machine shops and conveyance departments of each division. All costs outside the general office costs must be charged directly to the district department which incurred the expense.

CC *Commercial expense.* All expense in connection with the customers' accounts.

CD *Distribution expense.* Cost of conducting electric current from the substation terminal board to the customers' premises, including repairs to electric meters other than station meters.

CN *New business expense.* Cost of securing new business.

CP *Production expense.* Cost of electric current

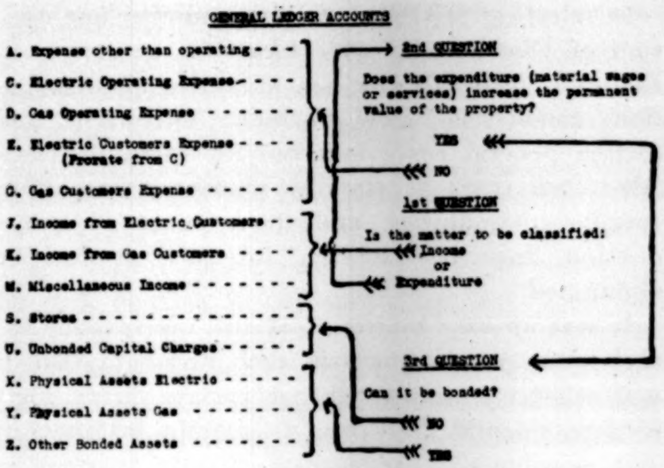

GENERAL LEDGER ACCOUNTS
A. Expense other than operating
C. Electric Operating Expense
D. Gas Operating Expense
E. Electric Customers Expense (Prorate from C)
G. Gas Customers Expense
J. Income from Electric Customers
K. Income from Gas Customers
M. Miscellaneous Income
S. Stores
U. Unbonded Capital Charges
X. Physical Assets Electric
Y. Physical Assets Gas
Z. Other Bonded Assets
2nd QUESTION
Does the expenditure (material wages or services) increase the permanent value of the property?
YES
NO
1st QUESTION
Is the matter to be classified:
Income
or
Expenditure
3rd QUESTION
Can it be bonded?
NO
YES

Figure 2

delivered to power station terminal board.

CT *Transmission expense.* Cost of conducting current from the power station terminal board to the substation terminal board.

CU *Utilization expense.* Cost of repairs to, renewals and trimming of, lamps; repairs to company's property on customers' premises made gratuitously but not for the purpose of securing new business. These costs are charged direct to the class of customers in the district in which the expense is incurred.

General expense was further subdivided as follows:

CBM General office of the entire property
CBN Time Keeping and Planning Departments
CBP Purchasing
CBS Stores Department
CBT Machine Shop and Tool Department
CBV Conveyance Department
CBX Laboratory and Testing Department

With the exception of the general office and purchasing, each of the above departments had a branch in the four district offices. The expense incurred by the departments in the district offices was generally local expense and could be charged directly either to a district or division. Such items as the salary and expenses of the general storekeeper, main testing laboratory, etc., were prorated, based upon the amount of expense incurred in each district.

The electric customers were classified as follows:

A Municipal lights
B Municipal metered incandescent lamps
C Commercial incandescent lamps
J Flat rate customers
K Curbstone lighting
M Mine customers
P Power customers (except mines)
R Residential metered customers
S Sign and display lighting
X Unclassified customers
Z All classes of customers

The class "Z," that is "all classes of customers," was used only to accumulate the total expense for the division when the expense incurred or prorated could not be charged directly to a specific class of customers.

Auxiliary Department

Purchasing, stores, planning, tool and machine shop, and conveyance expense were incurred for all departments. Purchasing expense was distributed on the basis of stores issued from each district store room and combined with the store room costs. This in turn was prorated to the departments on the basis of stores issued during the month to each division of the general departments under the jurisdiction of the planning department. The allocation was made on the basis of the expenditures made during the month. The expenses of the tool and machine and conveyance departments were distributed on an hourly rate, arrived at by the expense incurred by each vehicle and shop.

If, when using this classification, it will be kept in mind that the letter "C," as the first character in a symbol, always represents *"electric operating expense,"* the first letter symbol following "C" is a subdivision of the department, and the third letter following "C" is a detail of expense, the cost symbols used can easily be followed.

Likewise the letter "E," as the first character of a symbol, represents *"electric customers' expense,"* the first letter after "E" is always a district (county); the number preceding the division letter represents the various divisions (communities) of the district; the second letter following "E" is the class of customer served. Following are illustrations of symbols of *electric operating expense* and *electric customers' expense.*

C P A A C Electric Operating Expense
P Production Department
A Power Plant A
A Superintendence

E I P R E Electric Customers Expense
IP Division No. 1, District P
R Residential Customers

Symbols for *electric customers' expense* were not used by the operating departments, but were used in the accounting department for accumulating the total expenses incurred by the operating departments for the various classes of customers.

Types of Expense

It was found that expenses could be grouped under three general classes.

1. Expenses incurred for the property as a whole; items such as general office, purchasing, generating, etc., which could be prorated, based on the type or quantity of service rendered.

2. Expenses incurred for one or more districts or divisions; items such as transmission, standby plants, etc., which could be prorated to the divisions served, based on the service rendered. Likewise, expenses incurred in district offices; items such as commercial, new business, store keeping, planning, etc., which could be prorated, based on the service rendered to each division in the district.

3. Expenses incurred for specific classes of customers in one division, which could be charged directly; items such as the whole of utilization and such items of distribution as renewal of services, etc.

Classes of expense such as 1 and 2 necessarily had to be broken up into individual types of service rendered so as to secure the proper distribution. The manner of distributing the costs of each class can easily be followed if the three general classes of expense are kept in mind: (1) expense incurred for all customers of the entire property, district or division; (2) expense incurred for all classes of customers on part of the property, that is, one or more divisions; (3) expense incurred for specific classes of customers in one division.

It is obvious that the problem of allocating the costs of the several departments was somewhat different. Therefore, the approach was based entirely upon the type of service rendered by each department.

It is not necessary to go into details of each item of expense of any of the general departments. It is my intention rather to select one division and show the distribution of costs, first, to the division, and, second, to the classes of customers.

In selecting "EIP," that is, the number one division of District "P," (for location, see arrow on Figure 1, page 90), we can eliminate all distribution, commercial, new business, utilization, and certain general costs incurred for other districts. Also such costs as standby plants serving other specific communities, and the expense of transmission lines not serving this district can be eliminated.

It was an easy matter to secure the revenue for each class of customers in each division. Also, it was relatively easy to charge certain direct costs to departmental divisions. In certain instances it was possible to charge costs directly to class of customers in their respective division as illustrated by the utilization expense which is incurred for specific classes of customers in each division, and such items as reconnecting services, testing meters, and other direct distribution department costs.

The problem that had to be met was to discover how to make a fair allocation of expense that was incurred either for all customers on the property, such as general and production expense, and for such expenses as were incurred for all classes of customers in a certain district or division, such as that incurred by transmission, distribution lines, district commercial and new business offices, and like items.

To put the problem in another way, the distribution of costs of "C" (Electric Operating Expense) not chargeable directly to a specific division of "E" (Electric Customers' Expense) had to be allocated first to all classes of customers in each division and then to individual classes of customers, where in each instance it would be combined with the expense charged directly to that class of customers.

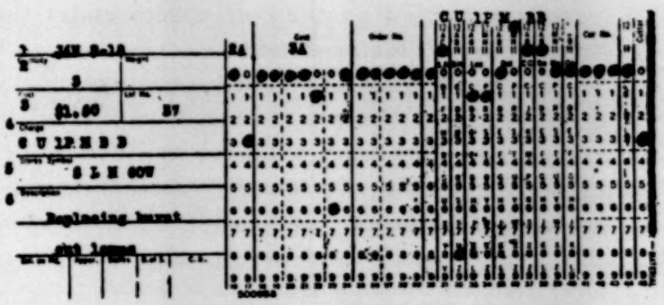
Planning Department

The first problem to be solved was how to secure accurate detailed charges. Although it was recognized that the tabulation of detailed costs secured was purely an accounting function, the problem of the old feud between the operating and accounting departments had to be faced. It was realized that costs secured and tabulated for accounting purposes only were not always beneficial and sometimes proved embarrassing even to a conscientious operating engineer. Therefore, it was necessary to sell to the operating departments the idea that true costs properly secured and tabulated would eliminate the constant criticism of expensive operating directed toward the operating department. By this statement is meant that proper accumulation of costs, combined with a practical working budget, could and would put the operating department in the position of knowing just what was expected of it. Any improvement in the performance of the task allotted to the operating staff would in each instance be reflected in the monthly statements.

Following the practice of industrial concerns, the connecting link between operating and accounting was made by creating a planning department, the function of which was to relieve the operating engineers of the mass of detail previously handled by them.

Such work as time keeping; ordering, receiving and issuing of stores; planning of work; progress on construction jobs; operation of the conveyances; the machine shop; testing laboratory; proper allocation of the charges of labor and material, etc., came under the jurisdiction of the planning department. The personnel of this department was necessarily of a composite type, composed of men experienced in cost and statistical work and practical operating. This department, although following the methods laid down by the accounting department for tabulation of costs and by the operating department for order of work and methods of operation, came under the direct supervision of the general manager of the property. This procedure effectually eliminated the constant friction frequently noted between the accounting and operating personnel.

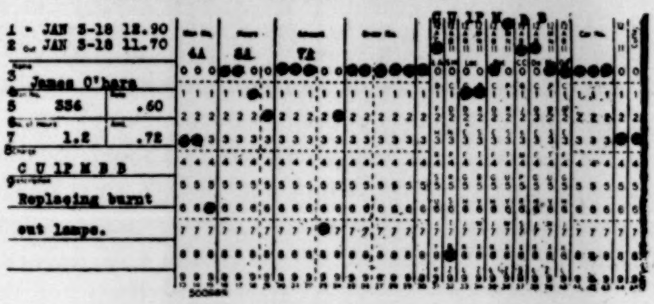
As we are not discussing operating methods, we can eliminate all work performed by the planning department, excepting that part pertaining directly to the accumulation of direct detail costs. Costs were accumulated under three main headings: labor, material and sundries—for operation, maintenance and construction. To facilitate the tabulation of costs, store issues, time cards, and sundry costs (voucher charges) forms were used in connection with the tabulating machines. (See Figures 3, 4 and 5 on this page). To eliminate the objection that the cards were not original records, the standard card was changed so that part of it was descriptive, showing all required information, such as dates, employes' numbers and rates, stores symbols, etc. The other part of the card was used for tabulating purposes.



JAN 3-18
3
$1.80 37
C U 1P M B B
S L M 60W
Replacing burnt
out lamps

Figure 3
Stores Issue

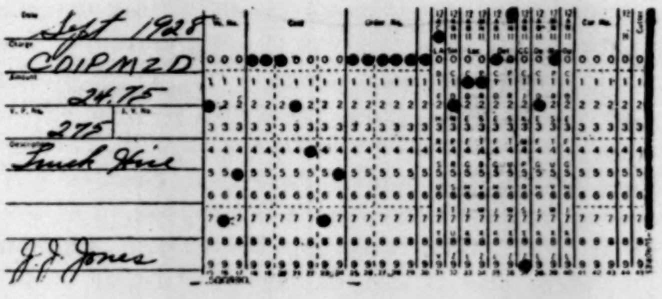
1—date, 2 & 2A—quantity, 3 & 3A—cost, 4—charge symbol, 5—stores symbol (for stores records only), 6—description of operation. The above illustrates how the original record was incorporated with tabulating records used for cost accounting purposes. From the information punched on the card any combination of costs could readily be secured.



1 - JAN 3-18 12.90
2 JAN 3-18 11.70
James O'hara
336 .60
1.2 .72
C U 1P M B B
Replacing burnt
out lamps.

Figure 4
Time Card

1—time operation finished, 2—time started, 3—name of employe, 4 & 4A—employe's number, 5—hourly rate, 6 & 6A—hours on operation, 7 & 7A—cost of operation, 8—charge symbol, 9—description of operation.



Sept 1928
C01PM2D
24.75
275
Truck Hire
J. J. Jones

Figure 5
Sundry Costs Card

All material used was taken through stores, although it may have been purchased for and delivered direct to the point where it was to be used. Tabulating cards were cut for each item charged out on a voucher, regardless of the nature of the expense. With these three classes of expense taken care of, the costs accumulated by the cost department could be tied in directly with the general ledger accounts corresponding to them.

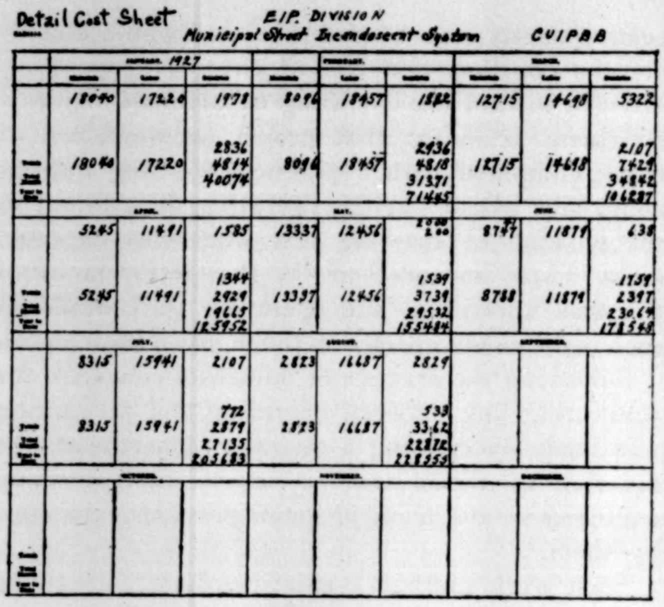
Costs were carried on the cost sheets under the headings of labor, material and sundries, for each item in the classification of detailed accounts. From the detailed sheets the costs were accumulated to plants, transmission lines, or divisions, then to departments for use in the monthly statement, and for prorating to divisions and classes of customers. By this method each item of expense, as well as the total department expense in each division, could be compared with the corresponding item in the budget. (See Figures 6 and 7 on this page.)

As has been stated, operating costs were divided into three general classes: labor, materials and sundries. The sundries class was used for all costs that could not be classified under either labor or materials; such items, for instance, as rent, traveling expenses, pole rentals, city inspection charges, salaries and expenses of superintendents, and like charges paid through voucher checks.

All time cards for employes were handled by the planning department. There the hourly rate, date, elapsed time, and charge symbol were entered, after which the time cards were sent to the cost department for extensions. The cards were then cut or punched for the tabulating machines, and accumulated until the end of the period. (For the time card, see Figue 4, page 93.)

At the end of the pay period the cards were sorted out by employe numbers through the sorting machine, then put through the tabulating machine to secure the total pay due to each employe. The total extensions were checked on a calculating machine by multiplying the hours worked by the hourly rate, then entered upon the payroll. Through this method the total distribution charges were sure to balance exactly with the payroll. The time cards were then resorted by charge symbols, tabulated, and posted to the cost ledger sheets. (See Figure 6 on this page.)

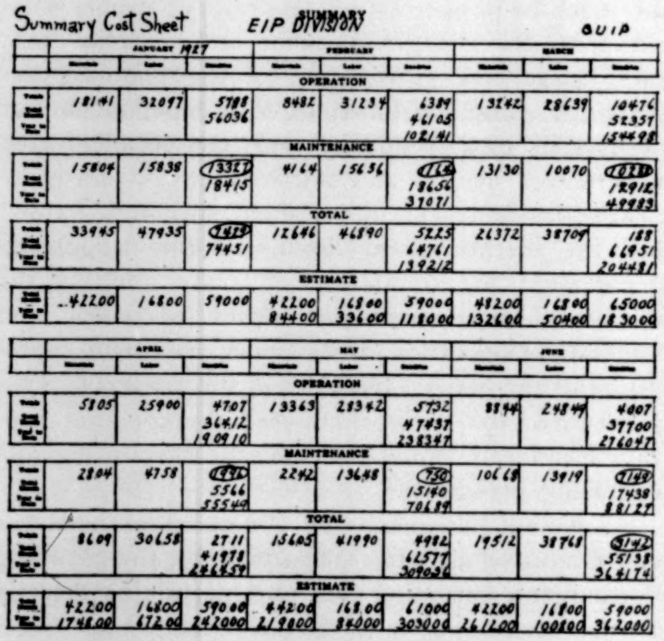
Stores issues were made out by the planning department, sent to the store room to be filled, then sent to the balance of stores clerk for extension, and then to the cost department to be cut, sorted by charge symbols and posted to the cost sheets at quarter monthly periods. (For Stores Issue, see Figure 3, page 93.)



Detail Cost Sheet
E.I.P. DIVISION
Municipal Street Incandescent System
CUIPBB

	JANUARY 1927			FEBRUARY			MARCH		
	18040	17220	1978	8096	18457	1882	12715	14698	5322
	18040	17220	2836 4814 40074	8096	18457	2936 4818 31371 71445	12715	14698	2107 7429 34842 106287
	APRIL			MAY			JUNE		
	5245	11491	1585	13337	12456	[illegible]	8747	11879	638
	5245	11491	1344 2929 19665 125952	13337	12456	1539 3739 29532 155484	8788	11879	1759 2397 23064 178548
	JULY			AUGUST			SEPTEMBER		
	8315	15941	2107	2823	16687	2829			
	8315	15941	772 2879 27135 205683	2823	16687	533 3362 22872 228555			
	OCTOBER			NOVEMBER			DECEMBER		

Figure 6



Summary Cost Sheet
EIP SUMMARY DIVISION
OUIP

	JANUARY 1927			FEBRUARY			MARCH		
OPERATION									
	18141	32097	5788 56036	8482	31234	6389 46105 102141	13242	28639	10476 52357 154498
MAINTENANCE									
	15804	15838	13327 18415	4164	15656	[illegible] 18656 37071	13130	10070	[illegible] 12912 49983
TOTAL									
	33945	47935	[illegible] 74451	12646	46890	5225 64761 139212	26372	38709	188 66951 204481
ESTIMATE									
	..42200	16800	59000	42200 84400	16800 33600	59000 118000	48200 132600	16800 50400	65000 183000

	APRIL			MAY			JUNE		
OPERATION									
	5805	25900	4707 36412 190910	13363	28342	5732 47437 238347	8844	24849	4007 37700 276047
MAINTENANCE									
	2804	4758	[illegible] 5566 55549	2242	13648	750 15140 70689	10668	13919	[illegible] 17438 88127
TOTAL									
	8609	30658	2711 41978 246459	15605	41990	4982 62577 309036	19512	38768	3142 55138 364174
ESTIMATE									
	42200 174800	16800 67200	59000 242000	44200 219000	16800 84000	61000 303000	42200 261200	16800 100800	59000 362000

Figure 7

Cards were cut for all payments made through voucher checks and the payments were posted to the sundries account at quarter monthly periods. The practice of posting charges at quarter monthly periods permitted a close check to be made on the yearly estimates. Graphic charts were used for this purpose. The yearly estimates were plotted in black ink and the actual costs plotted four times each month in red ink. (See Figure 7 above.)

A chart was used for each charge symbol, total plant, line, district, division, and department. Taking the production department as an example, there was a chart for each detailed operating and maintenance symbol, total operating, total maintenance, total plant and total production department.

Production Costs

As the location for a central generating station is always selected for its economic value to the property as a whole, it is safe to assume the position that costs of current delivered to the substations of the various communities, that is, generating cost plus transmission line losses, should be the same. It is not fair to penalize a community because the location of the generating station is a distance from the community. Standby plants that are located and maintained purely for the protection of certain communities are a legitimate expense, and distribution losses from the substation to the customers' meters may be considered chargeable to class of customers due to the greater number of lighting customers compared with power customers.

In this set-up of expense we have charged the same price for current to all customers, inasmuch as the distribution losses should be worked out on a different scale for each individual property. And the tabulation as given shows the cost of current, including both the power plant costs and the transmission and distribution line losses between the power plant switch boards (bus bars) and the customers' meters.

The location of Division "EIP" on the map (see Figure 1, page 90) shows that it is served by the active plants "CPA" and "CPB," also by the standby plants "CPC" and "CPD." In other words, it must stand its proportion of the expense of these four plants, depending on the percentage of the current used from each plant.

The KWH generated and the cost for the month selected are shown on Table 1 below. As the main generating plants "CPA" and "CPB" were used to serve all customers irrespective of divisions, we have combined the cost of those two plants. "CPE" is a standby plant for the district and has no bearing on the generating costs of the "EIP" division.

TABLE 1

PRODUCTION COST AND OUTPUT

PLANTS	K.W.H. OUTPUT	OPERATING COST	MAINTENANCE COST	TOTAL COST
CPC & D*	98,035	$2,551.21	$229.72	$2,780.93
CPE*	194,426	1,561.49	89.99	1,651.48
CPA	3,685,900	30,692.18	1,306.45	31,998.63
CPB Water Power	279,595			
CPB Steam	1,647,980			
TOTALS	5,905,936	$34,804.88	$1,626.16	$36,431.04

*Denotes standby plants.

The substation meters in the "P" district showed that there were metered into the "IP" division for the "EIP" customers 35.08 per cent of the output of plants "CPC" and "CPD," and 20.22 per cent of the combined output of the "CPA" and "CPB" stations. The division input and the cost of the same are shown by the tabulation on Table 2, page 96. The figures shown on Table 2 are the result of the consolidation of Tables 1A, 1B and 1C, pages 95 and 96. The complete allocation of the generating costs are shown on these three tables. In

TABLE IA

STANDBY PLANTS CPC & CPD

DIVISIONS	KWH INPUT	PER CENT INPUT	COST
E1P	34,391	35.08	$975.55
E2P	2,078	3.12	86.77
E3P	510	.52	14.46
E4P	2,716	2.77	77.03
E5P	3,157	3.22	89.55
E1S	54,958	55.06	1,531.18
E2S	225	.23	6.39
TOTALS	98,035	100.00	$2,780.93

TABLE 1B

CPA AND B

DISTRICTS	KWH INPUT	PER CENT INPUT	COST
E1P	1,002,784	20.22	$6,470.12
E2P	60,562	1.22	390.38
E3P	14,831	.30	96.00
E4P	79,294	1.60	511.98
E5P	91,918	1.85	591.98
E1S	1,602,597	32.31	10,338.75
E2S	6,885	.14	44.80
E1T	208,950	4.21	1,347.16
E2T	62,874	1.27	406.39
E3T	4,807	.10	32.00
E4T	8,959	.18	57.60
E5T	365,790	7.37	2,358.30
E1V	159,851	3.22	1,030.32
E2V	1,098,224	22.14	7,084.48
E3V	19,266	.38	121.60
E4V	15,754	.32	102.40
E5V	3,777	.08	25.60
E6V	1,785	.04	12.80
E7V	151,849	3.05	975.97
TOTAL	4,960,757	100.00	$31,998.63

TABLE 1C

Division	Input CPC-CPD	Input CPE	Input CPA-CPB	Transmission Loss	Total Division Input	Total Division Cost
E1P	34,391		1,002,784	128,656	1,165,831	$7,445.67
E2P	2,078		60,562	7,641	70,281	477.15
E3P	510		14,831	1,786	17,127	110.46
E4P	2,716		79,294	10,123	92,133	589.01
E5P	3,157		91,918	11,822	106,897	681.53
E1S	54,958		1,602,597	206,358	1,863,913	11,869.93
E2S	225		6,885	1,158	8,268	51.19
E1T			208,950	26,106	235,056	1,347.16
E2T			62,874	7,997	70,871	406.39
E3T			4,807	508	5,315	32.00
E4T			8,959	1,081	10,040	57.60
E5T			365,790	45,263	411,053	2,358.30
E1V		21,426	159,851	22,478	203,755	1,212.31
E2V		147,297	1,098,224	154,775	1,400,296	8,335.34
E3V		2,566	19,266	2,973	24,805	143.70
E4V		2,080	15,754	2,246	20,080	120.07
E5V		486	3,777	463	4,726	29.73
E6V		215	1,785	364	2,364	14.63
E7V		20,356	151,849	20,920	193,125	1,148.87
Total	98,035	194,426	4,960,757	652,718	5,905,936	$36,431.04

illustrating the final allocation of generating costs, only those for the "EIP" division need to be considered because the method of distribution is the same for all divisions.

TABLE 2

Cost of Current for Division E1P

From Plants	Input	Per Cent	Cost
CP C* & D*	34,391	35.08	$975.55
CP A & B	1,002,784	20.22	6,470.12
Transmission Loss	128,656		
Totals	1,165,831		$7,445.67

*Denotes standby plants.

TABLE 3

Class of Customer	Class Consumption	Per Cent	Production Cost
E1PA	63,800	7.8	$580.76
E1PB	1,078	.1	7.46
E1PC	337,685	41.4	3,082.51
E1PJ	4,391	.5	37.23
E1PK	9,860	1.2	89.35
E1PP	103,430	12.7	945.60
E1PR	287,240	35.2	2,620.87
E1PS	5,897	.7	52.11
E1PX	3,096	.4	29.78
Totals	816,477	100.00	$7,445.67

The total of the meter reading cards, as shown on Table 3 on this page, for each class of customers was used as the basis for allocating general costs to class of service. The difference between total consumption and the total input into the division represents the distribution loss and has no bearing on the final compilation as shown on Table 4A, page 97.

Transmission Expense

Again referring to the map, (see Figure 1, page 90), it will be noted that there are four incoming transmission lines connected with the substation serving district EIP.

CTA connecting power plant CPA
CTF connecting power plant CPB
CTE connecting power plant CPC
CTT connecting power plant CPD (Not shown on map)

There are many methods through which transmission line costs can be allocated, none of which can be considered infallible. A careful computation will prove that the minor discrepancies in all of the methods available are almost negligible, as far as the effect on the total cost of service is concerned.

If we assume that line losses should not be charged to districts because the outlying districts should not be held responsible for the location of the central generating stations, a combination formula of KWH-mile cost can be used with fairness to all communities to neutralize the extra cost incurred by the length of the transmission lines required to serve each district. By KWH-mile cost is meant the total KWH metered on the incoming meter of the substation chargeable to any given district, multiplied by the length of line from the generating plant serving th edivision to the substation of the district. The small extra cost chargeable to an outlying district is more than saved by the economies effected by the use of a few central stations instead of a smaller station in each district.

This method of distribution of transmission line costs is shown on Table 4A on this page. The table shows the distribution of the operating cost of transmission line CTA, which connects the generating plant CPA to the substation in EIP district. By this method of distribution of costs for the several transmission lines serving EIP the total transmission costs, as shown on Table 4 and Table 4B on this page, shows the transmission cost charged to district EIP, which charges are to be distributed to the classes of customers on the basis of consumption of each class.

Distribution Expense

Distribution costs include all expense incurred from the outgoing meter board at the substation to and including the customers' meters.

The expense of this department, with the exception of such items as supervision, is such that

TABLE 4

TOTAL TRANSMISSION COST FOR E1P

CTA	—	$258.56
CTF	—	19.25
CTT	—	169.12
CTE	—	167.00
TOTAL	—	$613.93

TABLE 4A

DISTRIBUTION OF TRANSMISSION LINE CTA COSTS

DIVISION	INPUT FROM LINE	MILES	KWH MILES	PER CENT	DIVISION COST
E1P	1,037,175	30	31,115,250	34.84	$258.56
2P	62,640	30	1,879,200	2.10	15.59
3P	15,341	30	460,230	.52	3.86
4P	82,010	30	2,460,300	2.76	20.48
5P	95,075	30	2,852,250	3.19	23.67
1S	1,657,555	30	49,726,650	55.69	413.31
3S	7,110	30	213,300	.24	1.79
2T	62,874	8	502,992	.56	4.16
3T	4,807	9	43,263	.05	.37
4T	8,959	5	44,795	.05	.38
TOTALS	3,033,546		89,298,230	100.00	$742.17

TABLE 4B

CLASS OF CUSTOMERS	PER CENT KWH USED	COST
E1PA	7.8	$47.89
E1PB	.1	.60
E1PC	41.4	254.17
E1PJ	.5	3.07
E1PK	1.2	7.37
E1PP	12.7	77.97
E1PR	35.2	216.10
E1PS	.7	4.30
E1PX	.4	2.46
TOTAL	100.0	$613.93

TABLE 5

E1P—EXPENSE

DEPARTMENT	TOTAL COST	CLASS OF CUSTOMERS								
		A	B	C	J	K	P	R	S	W
CBM—General Office	$4,326.61	—	4.33	683.60	34.61	34.61	103.84	3,461.29	4.33	—
CBN—Planning	Pro-rated to Departments									
CBP—Purchasing										
CPS—Stores										
CBT—Tool & Machine										
CBV—Conveyance										
CBX—Laboratory	140.52	—	.14	22.20	1.12	1.12	3.37	112.42	.14	—
CC—Commercial	1,157.05	—	1.16	182.81	9.26	9.25	27.77	925.64	1.16	—
CD—Distribution	1,349.34	62.06	1.35	203.75	9.45	9.45	31.03	1,030.90	1.35	—
CN—New Business	1,243.26	—	—	297.14	19.89	—	28.59	897.64	—	—
CP—Production	7,445.67	580.76	7.46	3,082.51	37.23	89.35	945.60	2,620.87	52.11	29.78
CT—Transmission	613.93	47.89	.60	254.17	3.07	7.37	77.97	216.10	4.30	2.46
CU—Utilization	1,432.34	567.84	4.08	155.89	2.10	17.84	119.04	563.43	2.12	—
TOTALS	$17,708.72	1,258.55	19.12	4,882.07	16.73	169.00	1,337.21	9,828.29	65.51	32.24

TABLE 5A

Class of Customer	Revenue	Operating Expense	Revenue Less Operating Expense
A	———	$1,258.55	———
B	———	19.12	———
C	———	4,882.07	———
J	———	16.73	———
K	———	169.00	———
P	———	1,337.21	———
R	———	9,828.29	———
S	———	65.51	———
W	———	32.24	———
Total		$17,708.72	

it can generally be charged directly to the division in which the expense was incurred. There are very few interdivision charges in this department. While in a manner this condition indicates that it would be rather easy to allocate the distribution department costs, it was found that it was more difficult to secure a fair allocation of costs for that department than for the production and transmission departments. The difficulty arose from the fact that distribution department expense was so varied in character that it could not be handled on a current consumption basis. It was found that part of the costs was incurred for all customers and part for individual classes. Therefore, it was necessary for accounting purposes to separate the charge symbols into two groups: (1) cost of maintenance of poles, cross arms, conductors and similar items used for primary lines which served all customers; and (2) cost of maintenance of poles, cross arms, conductors, transformers, individual services, meters and similar items which could be charged directly to class of customers.

The first class was prorated on a basis of number of customers. The second class required no proration as it was charged directly. The method stated above is of course only a general one. It is possible to go into the individual items of expense and secure a finer division of expense of classes. That method was given a trial, but it was found that for all practical purposes the difference in the total charged to each class varied but little from the results secured by using the general method. Therefore, this more complicated method was abandoned.

Commercial Expense

Commercial expense, that is, all expense incurred in connection with customers' accounts including such items as meter reading, billing, collecting, cashiers, etc., could, with the exception of the general collection office, be charged directly to each district office.

These direct charges, plus the portion of the general collection office prorated on the basis of the customers in each district, was in turn prorated to divisions and then to classes of customers. In prorating the charges to classes of customers, the allocation was based upon the proportion shared by each class.

Expenses incurred directly for one class of customers, such as those resulting from the use of automobiles in connection with the reading of power customers' meters in outlying districts and the time required to figure the bills of power customers, were charged directly to that class of service.

General Expense

General expense can be divided into two distinct classes: (1) salaries and expense of conducting the general office of the property, such as salaries and expenses of the general officers, general office expense, legal expense, publicity, and similar items; and (2) auxiliary department expense for planning and time keeping, store keeping, purchasing, machine shops, and conveyance departments and other expense specifically incurred for the operating departments.

The first class of expense, that of the general officers and general office expense, is incurred for the property as a whole, that is for all of the customers. As such, it should be allocated to the various districts based upon the number of customers in each division.

The second class of general expense is incurred for specific departments of the various divisions. The expense of these departments can be charged directly to the division departments based upon the unit of proration adopted, viz: planning and time keeping, by payroll; stores expense, by stores issued; purchasing, by stores issued; machine shop, by hourly rate of shop; conveyance department, by hourly rate of each car used.

The expense of the second class was carried under sundries on the cost ledgers and could be readily analyzed by consulting the proration sheet of each auxiliary department at the end of each month.

New Business Expense

New business expense, that is, cost of securing new business, was prorated upon the basis of new business secured. The cost of new business expense was separated into power and lighting divisions. Such a division of this expense permitted a fair allocation to both classes of service.

Utilization Expense

As this class of expense was incurred for specific classes of customers in specific divisions, there was no allocation of this expense required.

The complete spread of expense by departments is shown for the EIP division in Table 5, page 97. The total expense for each class of customer was then grouped and compared with the revenue as shown in Table 5A, page 98.

III. Conclusion

In conclusion it should be noted that there is no intention to claim that this is the last word to be said as to cost finding for an electric utility —far from it. The writer knows of no more profitable field for research. But in view of the fifteen years experience in operating this system it can be confidently asserted that the resulting costs afford not only dependable data for rate making purposes but, what is even more important, a very effective device for controlling and reducing costs.[3]

Discussion

John Bauer.[4] As an economist and rate analyst, I am in sympathy with every effort to establish better accounting classifications for the determination of costs, especially for the purpose of rate-making. I have been greatly interested in Mr. Reed's effort to establish a cost system by which he could show periodically the cost of the various classes of service in the different districts served by his company.

I have listened carefully to his explanations, to grasp clearly the several steps in his allocations and to weigh their significance from the standpoint of rate making. I have personally struggled far too often in rate cases against lack of adequate costs to be over critical when one so well qualified as Mr. Reed presents a system intended for complete cost showing. Nevertheless, I do not feel convinced that the plan presented is a practicable one, either from the general administrative standpoint or for the purpose of effective rate control. While my interest is principally on the rate side, the administrative considerations are equally important. It seems to me that if all the costs were necessarily to be allocated in the great detail presented by Mr. Reed the very cost of the work would be prohibitive, and I do not see just what corresponding advantages would be attained for executive purposes. What greater control would be achieved from the numerous apportionments that is not readily available under the existing classifications, either as to regular budgetary supervision or as to functional comparison of costs?

From the rate standpoint, I feel particularly dubious as to the usefulness of Mr. Reed's system. The objective is to present the complete cost of service for each group of consumers, in each community, according to the rate schedule. First, observe that practically none of the costs in any territory are directly chargeable to any class of consumers; they are jointly incurred for the various groups, and in large part jointly for the entire territory. As directly incurred, they are first classified according to the general system of accounts prescribed by the commission; then they are separated or prorated between the different localities served, and finally, as between the different classes of consumers. The line of allocation varies according to the character of the cost, and the basis of apportionment depends upon the nature of the cost, conditions of operation, as well as the classification of service.

Please note, therefore, the great variety in the steps and processes of prorating. It is well known that in any method of apportionment there is a large element of judgment or guess, which affects the reliability of the results. The more steps and variations there are in allocation, the greater is the uncertainty in the final quantities, either for executive or for rate making purposes. Even if the

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[3] The figures used in this paper are not actual operating costs. They are used simply to illustrate the method of cost distribution.

[4] Director, The American Public Utilities Bureau, New York.

several bases of prorating are most scientifically selected, the ultimate allocations can hardly be accepted as conclusive for the determination of rates.

It is to be observed, furthermore, that the basis of prorating to be adopted is an exceedingly important consideration, subject to wide difference of opinion. Mr. Reed may be correct in saying that for his particular company the bases selected by him would be satisfactory as between the different groups of consumers in the different territories served. But if we were concerned in an actual rate case, I might come to sharp disagreement with him. The final showing depends upon the methods used, and they depend upon judgment, which is not a fixed element in cost analysis and is affected by special interests. If there is doubt as to the proper bases to be adopted for any given company, there is much greater doubt whether any considerable uniformity could be reasonably established by a commission to apply to the various companies operating under different conditions. With my conception of the greatly varying conditions, I surmise that, for rate making purposes, a separate analysis must be made for each individual company. The steps and bases of allocation must be determined according to the special circumstances. I do not see how general rules can be laid down. I should wish to scrutinize very carefully the steps and processes selected for any particular company; and more, I should regard skeptically any general system for all the companies under the jurisdiction of a commission.

I have had considerable experience in cost apportionments for rate making, including uniform rules laid down by a commission. In one very important instance, I found especially that the general rules could not be applied to the special case; while they were satisfactory for administrative purposes, they produced unreasonable and unjust results under the particular circumstances. I had a hard job, however, to demonstrate the inapplicability of the rules. Perhaps this experience has produced special caution as to any comprehensive system which might prevent adequate scrutiny for individual cases. While accurate cost analysis is essential for rate making, the base of allocations must be carefully considered from the standpoint of the special facts of each company in relation to the consumers affected. When such an analysis has once been made, I do not see any great benefit from continuous accounting to present, for each month or for each year, complete cost allocations covering all the various costs incurred by the company. The vast details would not only be tremendously expensive, but might readily interfere with intelligent, subsequent analysis and rate determinations.

It is necessary to have accurate costs in relation to the various functions of service. For the most part, however, the existing classifications already provide quite adequately for such costs as a matter of regular accounting. The allocations between communities, and especially between classes of service, are best made at considerable intervals as matters of special analysis. The great difficulty in rate making has not been the inadequacy of cost accounting, but rather the indeterminateness of the return allowed on the property; the bulk of the litigation has involved the determination of the fair value and the rate of return.

Apart from this phase of rate making, the established cost classifications, it seems to me, are reasonably satisfactory; they furnish quite completely the basic data for proper analysis in most instances, as between communities and classes of consumers. When a complete cost analysis has once been made, and a rate schedule has been established which fixes reasonably the relative rates between the different classes, there is then no further need of detailed allocations for each month or year. Only after a considerable period may a re-analysis be necessary, to take into account fundamental changes that may have taken place in the interval.

In conclusion, let me restate my general sympathy with improved accounting methods and more accurate cost statements. I am reluctant, however, to place approval upon methods which do involve great amounts of work, and whose results must be called in question when an actual case of rate making arises.

Philander Betts.[8] At the outset I want to say that Mr. Reed's paper indicates a considerable study of the conditions under which the company under inquiry conducts its production and distribution. He deserves great credit for this. I must take serious exception, however, to many statements in the first four pages of this paper. I cannot help but take exception to these statements because they are to the general effect that the electric supply companies are hoodwinking the commissions, even when the companies are classifying their accounts in accordance with the prescribed methods.

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[8] Chief Engineer, New Jersey Board of Public Utility Commissioners, Newark, N. J.

In the first paragraph of the "Introduction" we find this: ". . . but the figures used for creating the formulae have seldom, if ever, been furnished to the consumer or to the utility commissions." It may be, and probably it is, true that a large proportion of the state commissions do not employ on their permanent staffs experts with the requisite education, training and experience to qualify them to develop the necessary facts from the data found in the books of the utility companies. I could name seven of the state commissions that do have on their permanent staffs experts of the kind I refer to. I could name three or four more commissions that, I know, do not have such permanent assistants.

On page 86, paragraph 3, I find this statement: "Under the present type of cost accounting a power and light company can render certain classes of service at a loss and have this loss made up by an excessive charge to other classes." Further down, referring to allocation of costs to classes of service, is this statement: "Until this is done the public, especially the small consumers who cannot employ an engineer to analyze their bills, will continue to look with suspicion not only upon the utility but also upon the commission."

In dealing with a matter as complicated as electric rates and the various factors which influence them, it goes without saying that the ordinary customer is not in a position ever to understand completely the logic of such rates. One must, as is the case with a great many other things in life, place some faith in those who are charged with the responsibility of safeguarding his interests. On page 87 Mr. Reed's paper deals with a matter which, unfortunately, has become quite controversial; that is, the wide variation between rates charged the ordinary small consumer and those charged the very large consumer whose bills run into many thousands of dollars a year. There have undoubtedly been cases where the companies have taken on large power customers at rates below those which should have been charged, partly on the assumption that anything at all which would improve the load factor must in some way, not fully understood, benefit the customers as a whole, and sometimes partly with the idea of preventing the installation of a private generating plant which might in time expand its activities so as materially to interfere with the development of the electric power company. I know of but one instance in recent years in the state of New Jersey where a special rate was made at a point below the actual out-of-pocket costs, and that only because the distributing company purchased its power in accordance with a schedule which differed in its type from the schedule under which this power was sold to the ultimate consumer. Upon an analysis of the actual production cost it was found that the price to the ultimate consumer would not result in a real loss but would result in a loss to the distribution company, which, however, was owned and controlled by the company producing the power. This, of course, resulted in unfairness through an impropriety, which was later corrected by a change in the method of charging the distribution company by the production company. I cannot agree, however, that in the state of New Jersey today any company is selling electrical energy at a point below the out-of-pocket costs, in which is included the appropriate fixed charges on all of the property used and useful in the supply of the particular customers, or class of customers.

A careful and honest application of Mr. Reed's system of allocating costs to the various classes of service will, of course, result in a great improvement over the slipshod methods employed by many of the smaller companies, but I am inclined to think from a careful reading of Mr. Reed's paper that he has never read the original basic paper on this subject presented by Mr. Henry L. Doherty in the early 90's. If anyone interested in the allocation of costs by public utilities has not read this paper I should suggest that, before going any further in any study of this matter, he go back to Mr. Doherty's original paper. He should also read and study a paper written by Mr. George G. Earle some twenty-five years ago on the subject of water rates for the city of New Orleans. I do not agree that Mr. Earle has developed the truly logical system of rates, but it may be remembered that the city of New Orleans, a large city previously without any water system, had installed in a comparatively short period of time a complete water system, and had required all of its citizens to discard their private supplies (consisting almost entirely of cisterns) and take service from the municipal supply.

On page 88, paragraph 4, I find certain statements that are absolutely untrue with regard to the majority of the large electric companies. This for instance: "In this period of the consolidation . . . . . there is a lack of the old-fashioned utility economy of operation that was formerly considered necessary to permit the operation of a utility without loss." (The decreases in rates charged by electric companies since these consolidations took place prove sufficiently, I think, that the statements are incorrect.) Mr. Reed gives as his reason for this statement: "First, the higher executives cannot under present methods of cost accounting accurately check the economy of operation of each individual property." This I cannot agree to. If these higher executives, so called, are merely accountants or bankers, or, as has sometimes happened, men of ample business training but without long experience in the electric lighting industry, they are not competent to obtain from the periodic reports submitted to the holding company by the operating companies, the information needed to determine whether subsidiary properties are being operated economically or not.

There is another point that I must take exception to. The second paragraph in the introduction commences: "The public service commissions who guarantee an adequate return on capital investment in the utilities which they regulate, ..." On page 88, paragraph 6: ". . . . . and so long as utility commissions permitted the earnings allowed to be based on replacement value, ..." Further down: "With the utility commissions acting on the theory that adequate returns must be based upon replacement values, ..." On page 88: "With the maximum replacement value allowed, ..." For my own information I should like to know what commission in this country is doing just this. Of course, it is impossible for any one individual to read all the decisions of all the commissions, and many of the decisions apparently indicate that the value of a property has been taken as the cost to reproduce the property as of the particular date when the matter was under consideration, but a careful study of these cases indicates no such thing. Even in the far famed Indianapolis water case, which has been referred to by so many as a case in which the full cost to reproduce the property new, on the date of the decision, was to be the basis for rates, a little study of the various figures submitted shows that this is not true. It is true in that case that the court allowed a value considerably in excess of the book cost of the property, but a value which was several million dollars lower than that claimed by the water company as being the full cost of reproduction on the date of the inquiry.

Much of Mr. Reed's paper is an argument to prove the necessity for proper allocation of detailed costs. There is no question in my mind at all of the value of detailed cost data, classified so as to make it possible to obtain the cost of service for each class of operation, and for each class of service or class of customer; but the mere statements that the commissions are not able to get from proper reports the information that they need does not strengthen the argument. Such arguments can only be made by those who, because of their lack of proper experience, are not qualified to make such an analysis.

Having entered my defense of the conduct of work by those public service commissions with which I am familiar, I wish to pass a few comments on the subject itself. Dr. Person asked me to make some comments on whether or not proper cost allocation was worth while; that is, whether it was in the last analysis of value to the public. In dealing with many matters concerning public utilities, I like, instead of using the word "public," to use the word "commonwealth," because to my mind that includes not only the customers of the public utility, the stockholders of the company, its directors and manager, but also other parts of our population who are not customers of the public utility and who, because of this, apparently obtain no advantage therefrom. There are a great many people who obtain benefits from our telegraph and telephone systems who never directly patronize either one of them. There are a great many of our people who are benefited by the existence of our railways who practically never travel on them or ship freight over them. Therefore, for the good of the whole commonwealth, I believe that the utility companies should keep their records and accounts in accordance with uniform and accepted methods. They should publish periodic reports with such information as would enable the representatives of the commonwealth, that is, the public service commissions, to analyze these reports and to know from time to time just what the operating results are. On their own initiative they should take up such matters as excessive rates, improper distribution of operating costs, undue and unjust discrimination, either for or against any particular class of service or any particular locality, and provide, without delay, for correction of such improper conditions. Our New Jersey commission, without the formality of public hearings, has in the last five years brought about reductions in electric rates in the state of New Jersey amounting to between seven and eight million dollars per annum. All of these reductions were made possible because of the growth in the business itself, and because of the economies brought about by both physical and corporate consolidation.

On page 99, paragraph 2, of Mr. Reed's paper, I note his statement: "It is possible to go into the individual items of expense and secure a finer division of expense of classes. That method was given a trial, but it was found that, for all practical purposes, the difference in the total charged to each class varied but little from the results secured from using the general method. Therefore, this more complicated method was abandoned." I am glad to have Mr. Reed make this statement. I have seen many calculations in which the detail went far beyond the necessities of the case—when it has been ascertained by careful check and studies that the variation in results is very small. For instance in this case, Mr. Reed cites the cost of distribution in the various areas referred to, and I reply that, when it is found that the unit cost chargeable to each unit of production sold would vary but slightly in the different areas, one is justified in striking averages and, as long as conditions continue, in refraining from the waste of time involved in keeping such accurate records of detail. Each case, however, must determine its own rules as to the extent to which details are to be recorded.

From Mr. Reed's paper I am not clear as to what physical data—e.g., the data concerning pounds of coal, car miles, KWH, gallons of water pumped, etc.—are to be immediately related to the financial figures, that is, the figures concerning cost. I have always contended that these figures should go right along with one another and be associated as early as possible. This calls for a somewhat different organization from that referred to by Mr. Reed. Under the "general manager" he has a planning department," and apparently the "auditing department" does not come under the general management. To my way of thinking the "comptroller" and the "treasurer" of the company, if the company is large enough to have both, are officers of the company and parallel to the "manager" in their authority. The "auditor," however, is the custodian of all records—not merely the records concerning dollars and cents, but the records concerning KWH, pounds of coal, car miles and all other data concerned in the operation of the utility. To make this effective, the "auditor" is a subordinate of the "general manager," who must always be an engineer. I know of a number of cases where the "general manager" of an electric light company is an "auditor," and the mistakes of this particular company in the development or the adjustment of rates have come entirely from the fact that the knowledge, which only an engineer could have concerning the details of construction and operation, is not possessed by the man having the title of "general manager."

How often do we see in an electric light company a statement presented to the management showing the financial results for a period and comparing these results with similar figures for other periods; but when the data concerning the actual output of the plant are asked for, the "auditor" knows nothing whatever about them and some cadet engineer is assigned to take this matter up and relate it to the figures presented by the "auditor." As I said above, the "auditor" ought to be the custodian of all figures concerning the company's operations, and with cadet engineers under his immediate supervision he should be able to make up for the "general manager" the complete report showing all relations concerning costs.

In the operation of the uniform system of accounts for electric utilities in New Jersey we have only found two places where accounting systems have not clearly shown the information needed. It has been customary to carry materials and supplies as a single item. In the development of costs and the separation of construction and maintenance costs, however, it is necessary to know how much c

of these materials and supplies (and, of course, the associated cost of handling the same both in the storeroom and in connection with transportation), properly belongs to construction and to maintenance.

Another item which has not been carefully handled in the general accounts, is the matter of "deposits." For many years we have had an account for deposits to guarantee payment of bills, but within the last few years many companies have been assisted in financing extensions by prospective customers, and it has been necessary in nearly every investigation of rates to ascertain independently the division of this deposit account among the two classes. The reason for this is that, in determining the rate base, the moneys deposited with the company to guarantee the payment of bills are not deducted because we require the companies to pay interest on these deposits; but the deposits to assist in financing line extensions must be deducted, as the very purpose of such deposits is to relieve the company, for the time being at least, of the burden of carrying unproductive investment.

In conclusion, I am afraid that Mr. Reed is trying to make too much of a mystery out of material which is now understood by many commission engineering and accounting experts, basing this opinion probably on the fact that a number of the commissions do not have this class of assistants. As the commissioners in many states may have been appointed or elected because of their political affiliations they may not be competent themselves to analyze these matters but must depend on what is handed to them by the utility companies, or by the attorneys for complainants.

I believe in uniform systems of accounts. I believe fully in the allocation of costs in such a manner as to record for prompt use the cost of the various classes of service, and where necessary the cost to different areas, particularly if there are geographical reasons for special provision for the service in certain areas. I believe further, however, most thoroughly in the association with the figures regarding dollars and cents of the figures concerning the physical data, that is, the KWH pounds of coal, car miles, etc.

While my comments may seem harsh and overcritical, I want to say at the same time that Mr. Reed's paper shows that he has given this matter very considerable study. On this account he deserves great credit for his work.

Judson C. Dickerman.[*] From the standpoint of a public utility commission staff member who has had to wrestle with the problem of the fairness of a particular rate for a class of service in an elaborate rate structure or of the relative fairness of the several rates one to the other, Mr. Reed's discussion is pertinent. Interested civic-minded people and the law as usually interpreted consider that utility rates should be based substantially on the costs of the service given and not on the possible competitive market value. Preferential and manifestly below cost rates for certain classes of services, viewed in the light of past experience of the company, were for years tolerated on the hypothesis that thereby new business would be possible for the utility which, when fully developed, would become normally profitable and of advantage to all consumers. So the then existing ordinary consumers had to meet, largely in the rates they paid, the losses incurred by this business taken at probably lower than complete costs. While such language was glibly employed by both management and commissions, it was not supported by any systematic cost finding exhibits, but rather found its justification in the seeming growing prosperity of the companies as shown by increasing net revenues, and by the decline in certain specific costs per average unit. No actual cost findings were obtained to show whether the new low rate was earning a fair profit or whether the prosperity of the company was due rather to too high payments by the large majority of high rate light and small power consumers. The chief, and perhaps only, well defined cost unit thus used was the average cost of generation at the power station. What went on in the rest of the system was usually neglected. Yet if anyone attempted to use this average generating cost as a starting point on which to check up the relative fairness of the rate structure, he was immediately overwhelmed by assertions about the differences in load factor, time and hours of use, all intended to give the impression that the low rates for large power and the high rates for smaller users and for light had almost no relation to this lowered average cost of generation.

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[*] Industrial Survey Department, Massachusetts Institute of Technology, **Cambridge, Mass.**

If you carry a rate case to a commission, or if a company wishes to change a rate with the sanction of a commission, the procedure will revolve around two distinct presentations. First, do the earnings of the company as a whole result in a fair return on its valuation for rate making; and second, what will be the increase or decrease in the gross revenue as a result of the proposed change in the particular rate. The whole case will revolve around these two factors with never any systematic presentation of cost finding data. "Opinions" of officials may be presented that costs justify the defended rate, but as far as I have ever heard, no utility has ever introduced into a rate case evidence of costs for each class of service to which a definite schedule applied, or which had been kept as a regular part of their accounting system. To be sure, the interested officials gather hastily some facts, add a lot of estimates and state therefrom their opinions as if as valuable as systematically derived cost figures. From such a situation a rate case necessarily drifts into a discussion of the valuation of the whole property and general conditions of management, from which the fog arising quite obscures the real question, "Is this particular rate in accordance with the actual fair costs of rendering the service to which it applies?"

Mr. Reed has pointed out that, with a declining price level, unearned profits to the utilities from post-war values enhanced beyond the actual pre-war investments are about over, and only profits from successful economies in operation are possible.

Another factor of importance from a public viewpoint is that the industry has apparently been largely stabilized for some years in its load factor and in the distribution of business between large and small and between light and power consumers. To postpone longer definite cost finding for groups of consumers who take service under specific class rates has no excuse under the plea of development. The combinations of small units of the industry into greater ones justifies the expense and skill required.

One of the best reasons for insisting that all concerned adopt this valuable procedure is that it already has been done successfully in guiding the policies of a large company.

As Mr. Reed declares, the details of the system he presents are not the last word but rather the first word. Convinced that public opinion demands better proof than now exists of the costs underlying the various rate schedules and that the public believes such cost finding is feasible, some of the qualified persons identified in both the ownership and regulation of our utilities should devise and put into effect adequate and understandable systems.

It is interesting to note the absence in Mr. Reed's method of any reference to demand, peak, time of use and length of use. His use of average costs per KWH of production, transmission, etc., is also interesting. He seems to recognize certain costs as based on the average KWH and others as on a consumer basis. The ordinary utility rate maker will, with a gesture of despair, declare that the vital problems of day or night use, large and small demand, and all the other fetishes that have been inherited from the past, make cost finding impossible, or at best largely a matter of opinion. But here is presented evidence of a capable management having used a method in controlling its business, both internally as a matter of management and externally in devising its rate schedules, and ignoring such demand, peak and size factors. Possibly these factors should be considered in formulating the steps and working out other characteristics of the rate schedule set up, but they are not necessary in getting at the actual cost results of operation for various subdivisions of consumer classes. It is, of course, to be noted that Mr. Reed did not carry his description into the capital accounts, but we assume the same principles would hold.

In conclusion, I might say that this year I have had an opportunity to examine at first hand the original sworn filed reports of many electric utilities under the jurisdiction of at least eight separate commissions from Maine to Missouri. As a whole they are far from comparable with each other and are more or less inadequate to meet even demands for clear cut costs under the present accounting divisions. Many reports fail to follow closely the definite requirements of the commissions' accounting report orders. No harm, and probably some good, can come by redesigning our whole public reporting system to produce real cost finding data.

Samuel Ferguson.[7] The members of the Taylor Society whose concepts of cost accounting are predicated on the correct determination of the facts pertaining to costs must be amazed at the principle enunciated by Mr. Reed in the following paragraph (page 95):

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[7] President, Hartford Electric Light Company, Hartford, Conn.

> As the location for a central generating station is always selected for its economic value to the property as a whole, it is safe to assume the position that *cost of current* delivered to the substations of the various communities, that is, generating cost plus transmission line losses, *should be the same.* It is not fair to penalize a community because the location of the generating station is a distance from the community.

In these few words Mr. Reed lays down as a rule for guidance in cost determination the principle that because a certain selling price for the goods is equitable, costs should be so allocated as to make the price appear to be based on costs.

I am not quarreling with Mr. Reed relative to his assumption of what is equitable in prices, but I do not wish to fool myself as to what constitutes true cost in order to create a fictitious cost base on which to build price.

To my mind the refinements of allocation so ably described in the paper are a waste of effort, if based on the fallacy that the facts entering into costs must to any degree whatsoever be twisted to fit a preconceived notion as to selling price.

It is obvious that there is a greater cost involved in serving a customer at a distance than one near to the generating station, and a cost system which tells a different story is on the face of it inherently fallacious, nor does the fact that the price to each customer should be made the same have any effect whatever on the cold facts of cost.

Malcolm F. Orton.[*] I fear that if President Cooke desired to have a discussion of this paper from the standpoint of cost accounting, as an aid to management rather than as a means of rate fixing he should have seen to it that a different set of men were chosen to discuss it. Speaking for myself, I naturally prepared to discuss the relationship of costs to rates in public utilities because I think I have something to say on that point, while I am free to admit that I do not feel competent to discuss the methods of budgetary cost control as an aid to efficient management.

I do not intend to disparage or minimize the place of cost accounting and cost study in rate-making, for I appreciate that no proper results can be reached without the fullest possible knowledge of the facts involved. But to my mind there are one or two dangers in connection with the application of cost data to rate making.

In rate cases the companies usually pursue one of two courses. Some of them declare that there is no possible means of dividing costs between the different classes of service, and that all the regulatory bodies can assume to do is to see that the over-all earnings of the companies are not too large, leaving to the management entire discretion in fixing the rates for the different classes of service. It is needless to remark that these are the cases where the management itself has no real basis for fixing these rates, but relies upon a blind following of relationships established in the distant past or upon an inner feeling that certain classes of business are profitable or unprofitable.

On the other hand there are companies which appear before the regulatory authorities with a set-up purporting to show the exact cost of each class of service. This gives the impression that everything has been measured mathematically and put into the proper classification by invariable accounting methods, and that there is nothing more to be said so far as the question of cost is concerned. All the commission has to do is to fix rates in accordance therewith and perhaps give a little consideration to the fact that some classes of service really cannot afford to pay the full cost.

This testimony may be based upon a regular cost system, though usually it is based upon studies made especially for the purpose of the rate case. In either case, a searching cross-examination usually reveals the fact that the various costs are not so absolute and exact as they appear on the surface. It is found that joint costs have been apportioned upon more or less arbitrary bases, and that certain considerations of a commercial or public policy nature have been injected into the cost study below the surface. The statement is sometimes made that while these are the costs, of course consideration must be given to other factors in fixing rates. But once you start departing from the costs as found, there is nothing whatever to show how far rates may safely vary therefrom. The result is that the regulating authorities usually either follow the costs blindly or throw them overboard entirely. Both results are unfortunate.

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[*] Public Utility Consultant with Milo R. Maltbie, New York.

It seems to me that such cost systems or cost studies as these are based upon a wrong conception of the place of cost accounting and cost data in the scheme of price fixing. In any case involving joint costs or fixed costs, the cost system cannot produce a price. It cannot even produce a single amount as the cost of a unit of product and say "that is *the cost* of the unit."

O. M. Rau.[9] Mr. Reed's paper, from an accounting standpoint, indicates that cost accounting can be applied to an electric utility, which contention is not generally recognized by the industry.

With such a system of cost accounting available, there should be no difficulty in allocating costs so that the *cost to serve* each particular class of consumers can be accurately ascertained. Rate schedules as a rule cover classes of service having definite load characteristics. Therefore, the allocation of costs in accordance with the characteristics of the load which is directly responsible for fluctuations in costs can be charged to each rate schedule responsible for the costs involved.

With a complete cost accounting system (unfortunately Mr. Reed's paper only covers operating expenses) the present method of establishing rate schedules by a complicated analysis to justify them, should be discarded and the rate schedule based on an accurate *cost to serve* basis.

Assuming all consumers to have similar load characteristics, this system of cost accounting would develop a situation where the *cost to serve* would be identical for the major items in the classification for each consumer, and the only reason for more than one rate schedule would be the secondary or minor charges covering service rendered by the company which was not governed by the load characteristic and principally covered by utilization and public policy expenses. These expenses would not effect a material difference in the rate schedules and would not cause a spread of more than a fraction of a cent between all the top rates.

In Mr. Reed's paper the important item of fixed charges approximating 50 per cent of the total cost to serve is not covered in detail. The failure to allocate these expenses by a definite cost accounting system is largely responsible for the existing wide spread between rate schedules applied to large and small consumers.

It is therefore necessary, before an accurate *cost to serve* allocation can be made for each rate schedule, to extend the able work presented by Mr. Reed to include a cost accounting system which will dispose in an accurate manner this part of the problem of electric utility cost accounting.

News of the Sections

Eastern Massachusetts

The first meeting of the reorganized Eastern Massachusetts Section of the Taylor Society, arranged by Percy S. Brown, past president of the Society, was held at the Hotel Winchester, Boston, Mass., on April 8. The meeting took the form of a general discussion of the question "Is there a vital problem in connection with the retention or hiring of people of middle age and over in gainful occupations?" Able leaders in the fields of education, industry, engineering, labor and others were invited to participate. So much interest was evidenced that it was decided, with the aid of a fact finding committee, to continue the discussion through a series of two or three monthly meetings on which we hope to be able to publish a report.

Those interested in further information concerning meetings of this section should address the secretary, Mr. Raymond L. Tweedy, Manufacturers Research Association, 80 Federal Street, Boston.

Central New York

The last meeting of the Central New York Section was held on March 29 at the Hotel Syracuse. Roy S. Durstine, partner and general manager of Bruce Barton's Advertising Agency, spoke on "Lessons for Management from Advertising."

New York Metropolitan

At the March meeting of the New York Metropolitan Section Professor Joseph H. Willits spoke on his year's observations of industrial relations in Germany. The April 18 meeting on "Group Incentives—Some Variations in the Use of Group Bonus and Gang Piece Work" was addressed by C. C. Balderston of the Industrial Research Department of the Wharton School.

University of Pennsylvania

On April 18 at Logan Hall Fred W. Shibley, President of the Bankers Trust Company, addressed a group of more than one hundred members and friends of the Taylor Society in Philadelphia. A considerable number of Philadelphia bankers were present to hear him speak on "The Banker's Interest in Industrial Management," a subject on which he has written with such power.

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[9] Consulting Electrical Engineer, Philadelphia, Pa.

Fourth International Management Congress

IT IS suggested that every reader who expects to be in Europe this summer plan to include attendance at the Congress in Paris, June 19-23. The sections are as follows: I, Industry; II, Agriculture; III, Commerce; IV, Administration; V, Domestic Economy; VI, Methods and Propaganda. The United States will be represented by fifteen papers which are being arranged by a subcommittee of the Committee on Participation in International Management Congresses, made up of representatives of the American Management Association, the American Society of Mechanical Engineers (Management Division), the Society of Industrial Engineers and the Taylor Society. Members of these societies should address inquiries to their secretaries; others to the Joint Committee on Management Congresses, Room 1120, 29 West 39th Street, New York.

The New Germany—A Review[1]

By Sylvia Kopald Selekman[2]

WITH the passing of the tenth anniversary of the birth of the German Republic; with the increasing stream of information flowing from Germany, and with the impressions which first-hand visits force upon foreign observers, there is emerging a widening conviction that present-day Germany offers the contours of a remarkable achievement. Only ten years ago Germany faced the world defeated, hated, uncertain of what the future held, wracked by revolution, hunger and economic exhaustion. During the crowded decade that followed she literally plumbed the depths, torn by every cataclysm that can afflict modern social life—revolution, reaction, civil war, famine, loss of territory, productive stagnation, weird speculation, inflation, financial collapse, deflation, foreign occupation, burdens of war debt and reparations. Today, though many severe problems still remain, Germany has undoubtedly launched on thoroughgoing reconstruction.

In these three books, different as they are in method and mood, are presented three important aspects of this momentous story. Mr. Daniels, in "The Rise of the German Republic," traces the catastrophic events through which Germany moved from a defeated monarchical state to an advanced experiment in modern democracy. The social and human effects of these stormy years are suggested by the mellowed, chatty observations of Professor Danton upon his year as visiting professor at the University of Leipsig. Finally the contributors to the new German Commerce Yearbook present in statistics and analyses the commercial and industrial situation of Germany today as she enters upon comparative stability.

Mr. Daniels, in spite of his best efforts, is still a prejudiced chronicler. He makes, it must be admitted, no pretense to scientific methodology in weighing recent events in Germany, claiming for his bulky volume no more than "the application of a quasi-historical form to the fruits of personal recollection, experience, and enquiry." Yet the fruits thus combined into historic narrative remain often embittered by the passions of the war allignment. Bald statements of events are thus rather startlingly underscored by acidulous comment and distrustful search for possibly sinister hidden motives. His spirit of hostile judge, seeing the boundaries of good and evil exactly coincident with those between his own side and the other, elicits from him this revealing finale to his tale of the stirring upheaval out of which a new Germany is emerging. "But for the Treaty of Versailles, with all its defects, the second European war would have begun to be fought by now. A peace on terms conceived by Germans in the flush of their victory would have carried with it the certainty of a new war. Would Germany have considered revision? It is unlikely. As for the Peace of Versailles its authors have never claimed that it was perfect. The Germans are already demanding that it should be revised. But those who have observed the progress of events in Germany since it was concluded cannot escape the conviction that its revision—indirectly and in part already begun—is better in our hands than in theirs." Yet even some of Mr. Daniels' compatriots would point out to him that *tu quoque* was never very convincing proof of greater moral responsibility.

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[1] A Review of the *German Commerce Yearbook, 1928,* edited by Dr. H. Kuhnert in co-operation with the German Association to Foster Trade Relations Between Germany and the U. S. A. B. Westerman Co., Inc., New York, 1928, pages xvi, 375;
The Rise of the German Republic by H. G. Daniels, Charles Scribner's Sons, New York, 1928, pages xi, 292;
Germany Ten Years After by George H. Danton, Houghton Mifflin Company, Boston and New York, 1928, pages x, 295.

[2] Hunter College of the City of New York, New York.

Nevertheless, in spite of his acid, Mr. Daniels' account gives the savor of the dramatic history which Germany has been writing since the war. From the strikes and mutinies that presaged the end of the monarchy through the confused battle of sovietists and social democrats, when socialists defended law and order, the Weimar Constitution emerged. For all its inevitable compromises, it gave what had just been the Kaiser's Germany the framework of a democratic state within which mechanisms of economic and social, as well as of political, democracy were incorporated. What can be realized through these mechanisms time alone will tell. But before Germany could really proceed to the notable experiment, she had to grapple with the menace of a ruthless militaristic reaction, with state separatism, with upheavals consequent upon foreign occupation, with the problems of reparation and economic disorganization, with a most stupendous currency inflation.

To take up Professor Danton's book at this point is to understand what such experiences meant to the masses of "just folks" involved in them. Professor Danton's tolerant wisdom, sympathetic insight and ripened knowledge of such widely varying civilizations as the Chinese, the American and the German, helps him to present this side of the German story with fine understanding. It is not the reactions of the workers of which he tells—but predominantly those of the university groups, the cultured intellectuals to whom tradition, art, literature, beauty and science have long been major concerns. Yet looking out upon Germany from this particular vantage point Professor Danton can see the lives of many other kinds of people—workers and business men, old and young, shopkeepers and rentiers.

Thus he can pack into a sentence visions of intolerable pain. "Nowhere in the world do the faces of the aged show such signs of suffering," he remarks, contrasting the hopeless and settled despair of Germany's post-war "old at middle age" with the serenity of the aged Chinese. And one sees as in a rapid reel the horror of growing old in a society under which the familiar past has collapsed, in which the present has no assured place even for the young and strong, and from which the future stretches a vast and unknown quantity. So one finds war ruins, Professor Danton points out, not in battle-scarred territory, but in the faces of men and women with "the axe over their heads," in the searing memories of hunger and suffering still vivid even among women "of refinement and education," in the blighting intellectual isolation derived from a sense of being hated.

In their reaction from this situation, Professor Danton found much among the people that was unlovely — anti-Semitism, separatism, hypersensitiveness. But he obviously feels that the vitality of the German culture will persist triumphantly even through such vicissitudes, continuing the fine dedication of the people to art, music, science and education. In this conviction he portrays school and university, student life, theatre and literature under the terrific impact of the crowded years since 1918.

That such conviction is justified, can be read in the prosaic significance of the fact-filled pages of the German Commerce Yearbook 1928. In it forty-three leaders survey from the hard-headed viewpoints of industry and commerce, the present position of German economic life in all its phases, with special emphasis upon relationships between Germany and the United States. It is to be hoped that the Yearbook will realize its present plans to appear annually. It will offer a valuable instrument in acquainting American students, management officials and business men with the further progress of Germany toward rationalization, reconstruction and permanent stability.

Dealing with the position of Germany in 1926 and part of 1927, the Yearbook is divided into three parts. The first sketches the "inner structure of the German economic system and treats particularly of relationships between Germany and the United States as expressed in trade, foreign loans, treaties and laws and specific institutes of interchange." In Part II the institutions and facilities serving in the exchange of goods and persons between Germany and the rest of the world are described—as for instance the state railways, postal and telegraph service, shipping and air transport and tourist traffic. Finally the development, present conditions and future prospects of German economy are presented.

Perhaps two quotations will serve to indicate the improvements which are appearing in Germany's economic position. "The needs of a large part of business have apparently been met, the domestic money market is opening up more and more, German interest rates have changed materially so that there is not nearly as much inducement or necessity now to obtain long-term loans from abroad, as there was but a little while ago." (p. 45). "Since the fall of 1926, production and sales have considerably improved in nearly all branches of industry, so that in some of them pre-war conditions have been surpassed. This revival has, however, so far been only confined to domestic markets. German exportation has made only small progress, with the exception of coal, a strong temporary increase in the exportation of which occurred in consequence of the British miners' strike . . . . As against this, due to the improved economic situation, importation of raw materials and also importation of manufactured goods has grown during the last months, in consequence whereof the balance of trade is once more passive, the excess of imports over exports having reached about $300,000,000." (p. 189).

The reader leaves such books with no belief, of course, that the great problems facing new Germany have all achieved settlement. The problems of paying reparations, the foreign loans, the possibility that much of recent economic improvements may have proceeded from the demands for equipment stimulated by rationalization, the still-present possibility of reaction and many other problems inherited from the war and its aftermath need grappling with.

Yet engrossing as are the stories told by these books, members of the Taylor Society will close them only to feel that another must be written presenting that part of the German experience in which they are most interested. The progress in scientific management achieved by Germany prior to 1914 was halted by the war and the immediate years following. But since the stabilization of the mark, it has been more than resumed. The rationalization of German industry as part of the national effort toward recovery, with its accompanying movements for standardization, simplification, improved technique and equipment, industrial psychology, expansion of cartels and combinations is perhaps one of the most momentous forces shaping the future of the new Germany. Its details, including the part played by trade unions as well as industrialists, is the next chapter in the post-war history of Germany, for which we shall eagerly watch.

Reviews

Sales Management Fundamentals. By Richard C. Hay, Harper & Brothers, New York, 1929, pages xi, 249.

This is a splendid book covering many of the fundamentals in sales management. It is written in a very easy style, and the use of technical terms and phrases is entirely absent. It is filled with many common sense suggestions on sales management. The author has treated the major fundamentals in sales clearly, and with a great deal of sound judgment. His comments and suggestions are based on actual experience covering a very wide and varied field of operation.

He emphasizes two or three very important subjects which are neglected by many managers of distribution, and they are the subjects of training and market analysis. The section on the training of salesmen is particularly good. It not only carries through the training of new salesmen, which of course is always important, but brings out suggestions about the training of senior salesmen. It also emphasizes the perpetual training of all salesmen which in many organizations is somewhat lost sight of.

The comments on compensation are quite inclusive of the varied methods of payment, and while no solution is given to this most important subject, there are many suggestions of value which can well be followed in the handling of this subject.

While no definite recommendations are made on specific things, the author has given many valuable suggestions covering many of the fundamentals in sales management and covers the questions from various angles. It is a book that can be read with considerable profit by sales managers and other executives as well.

G. V. S. CARROLL[1]

Factory Management. By Paul M. Atkins, Prentice-Hall, Inc., New York, 1926, pages xiii, 386.

The purpose of this book is to provide the student of management with enough data to introduce him to a comprehensive study of this field. "It is based on the idea that the control of production is one of the major functions of a business administration, a function which in many ways touches and even overlaps that of the technical engineer on one hand, while at the same time, it interlocks with other business functions on the other hand.

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"It has been planned on the supposition that students using it will have already taken a course in business administration and have some conception of the more important business functions and their inter-relationships and that, in addition they know something about typical manufacturing processes and equipment."

In his discussion on the "Selection of Workers" the author briefly and effectively points out that the management "should realize that the human side is the bigger and more important when considering the worker as a means of production."

The opinion has very often been expressed and the idea practised in some plants today, that the worker, if given the proper incentive, will determine the best method for doing his work. "It is seldom that a worker can develop on his own responsibility the best method of doing his work. In the first place he seldom has had sufficient training in the fundamentals of the work which he is doing to be able to decide whether the method he is employing is the best one or not. He lacks the experience which is essential to the formation of a sound judgment in the matter."

On the subject of standards for employes, in his chapter on "Manufacturing Standards," the author gives the reader the impression that substandard or superstandard workmen are useless as subjects for setting standards of work. This is certainly true in the case of the former from the point of view of time only. The superstandard, on the other hand, is undesirable because "he will give good methods but his time will be too fast in most cases to be realized by other workers." In other words, the author seems to think that the superstandard worker is of no additional value to the management aside from the extra work he turns out.

We should be glad to have this type of worker in our industries. His performance should be carefully studied; improved if possible, and his method transferred to others, making the proper allowances for the beginner while he is acquiring the desired automaticity. By ignoring the superstandard worker the analyst is not only doing the worker an injustice but he is also wasting a good opportunity to get data which is valuable in setting the standard of performance.

Much can be learned from the worker who appears to have the best method, from the point of view of fatigue or unnecessary motions, for the complete cycle or any part of it. This worker may not necessarily produce as much as the superstandard but his method may have greater possibilities. The difference in production, however, is very often due to strenuosity rather than efficiency.

The reviewer questions the value of the technique employed in making a "Time and Motion Study" as described in the volume. According to the author, the way to improve a method is to break down the job into its suboperations, then to make an "analytical" time study. The time data is analyzed and obvious changes in the method made; a new time study is made and the data again analyzed. If further changes in the method result, more time studies are made and so on until the best method "as far as can be seen" is reached. Finally, for the purpose of determining the standard, it becomes necessary to make what is termed "a constructive" time study in order that the time required with the new method may be recorded.

If the analyst seeks to improve the method as well as to make an accurate record of the time, why should he not use the technique which will enable him to record not only time but methods as well? The author concedes the fact that the limitations under which the analyst must work when studying an operation with the use of a stop watch are removed if the time and method are recorded accurately and simultaneously with a motion picture camera and Gilbreth clock. In his opinion, however, the latter method of recording "involves the use of specialized and expensive apparatus" as well as the "training of the observer in the methods of manipulating a camera and in the art of making good motion pictures."

If a business organization can afford to employ an analyst, it can well afford to give him a small motion picture camera and a projector, which are unfortunately more popular in the outdoors and about the home than in industry. As to the amount of training necessary, the reviewer dares say that, as far as the recording of method and time is concerned, less training and skill are required to use the motion picture camera than to record the time and method with the aid only of a stop watch and the naked eye.

Few men, especially those in the analytical work, most of them technical men by training, have escaped the study of physics which gives them the necessary fundamentals of photography. The simplicity of the manipulation of the camera of today is such that a layman can, in a few hours, learn to take satisfactory pictures.

By citing concrete examples the author presents the uses and need of the various steps required to "carry on" manufacturing on an efficient basis and succeeds in showing that production control *is* one of the major functions of a business organization.

One of the most interesting and instructive chapters in the book is that on making standards permanent. It shows clearly the amount of educational work which must be done to make standards permanent and to maintain improved conditions.

The relation of the work of one department to that of the others in a scientifically managed plant is logically presented. The activities of each function are well defined and the book should serve as an excellent text for the student in manufacturing administration, whether in the factory or in school. The reviewer appreciates the author's treatment of the functions of each department. It shows the modifications necessary to adapt the fundamentals of good management to the continuous process and to the jobbing business.

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